

February 2020



TRAFFIC STUDY

Proposed Delivery Station Building
100 Industrial Park Road
Hingham, MA

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Architecture
Engineering
Environmental
Land Surveying

EXECUTIVE SUMMARY	i
I. INTRODUCTION	2
II. EXISTING CONDITIONS	4
Access Network	4
Intersection Characteristics	5
Existing Traffic Volumes	7
Crash Data Analysis	9
III. PROJECTED TRAFFIC CONDITIONS	12
No Build Traffic Volumes	12
Build Improvements	12
Trip Generation and On-Site Circulation	14
Trip Distribution	15
Assigned Site Generated Traffic Volumes	15
Build Traffic Volumes	18
IV. ROADWAY ADEQUACY	20
Signalized Intersections	21
Unsignalized Intersections	22
V. CONCLUSIONS AND RECOMMENDATIONS	26

ILLUSTRATIONS

FIGURE 1 – LOCATION MAP	3
FIGURE 2 – EXISTING (2019) TRAFFIC VOLUMES	8
FIGURE 3 – NO BUILD (2020) TRAFFIC VOLUMES	13
FIGURE 4 – TRIP DISTRIBUTION	16
FIGURE 5 – SITE GENERATED TRAFFIC VOLUMES	17
FIGURE 6 – BUILD (2020) TRAFFIC VOLUMES	19

TABLES

TABLE 1 – CRASH DATA SUMMARY	10
TABLE 2 – PEAK HOUR TRIP GENERATION	15
TABLE 3 – SIGNALIZED INTERSECTION – LEVEL OF SERVICE	21
TABLE 4 – UNSIGNALIZED INTERSECTION – LEVEL OF SERVICE	22
TABLE 5 – PEAK HOUR LEVELS OF SERVICE	23

APPENDIX

CAPACITY ANALYSES

EXECUTIVE SUMMARY

This traffic study has been prepared for a new tenant and change of use of an existing building at 100 Industrial Park Road in Hingham, MA. The study area is primarily in a highway industrial zone of Hingham and serves access to commercial properties. The site currently has an approximately 149,000 SF building. The site will serve as a package delivery station which will provide “last mile” package delivery services to residences and businesses with an approximate 60-minute driving time radius of the site.

This study investigated the potential traffic impacts of the proposed development during the weekday morning, afternoon and evening traffic periods. To assess existing traffic conditions in the vicinity of the site, peak hour manual turning movement traffic volumes, vehicle classification and pedestrian counts were recorded at key intersections within the study area.

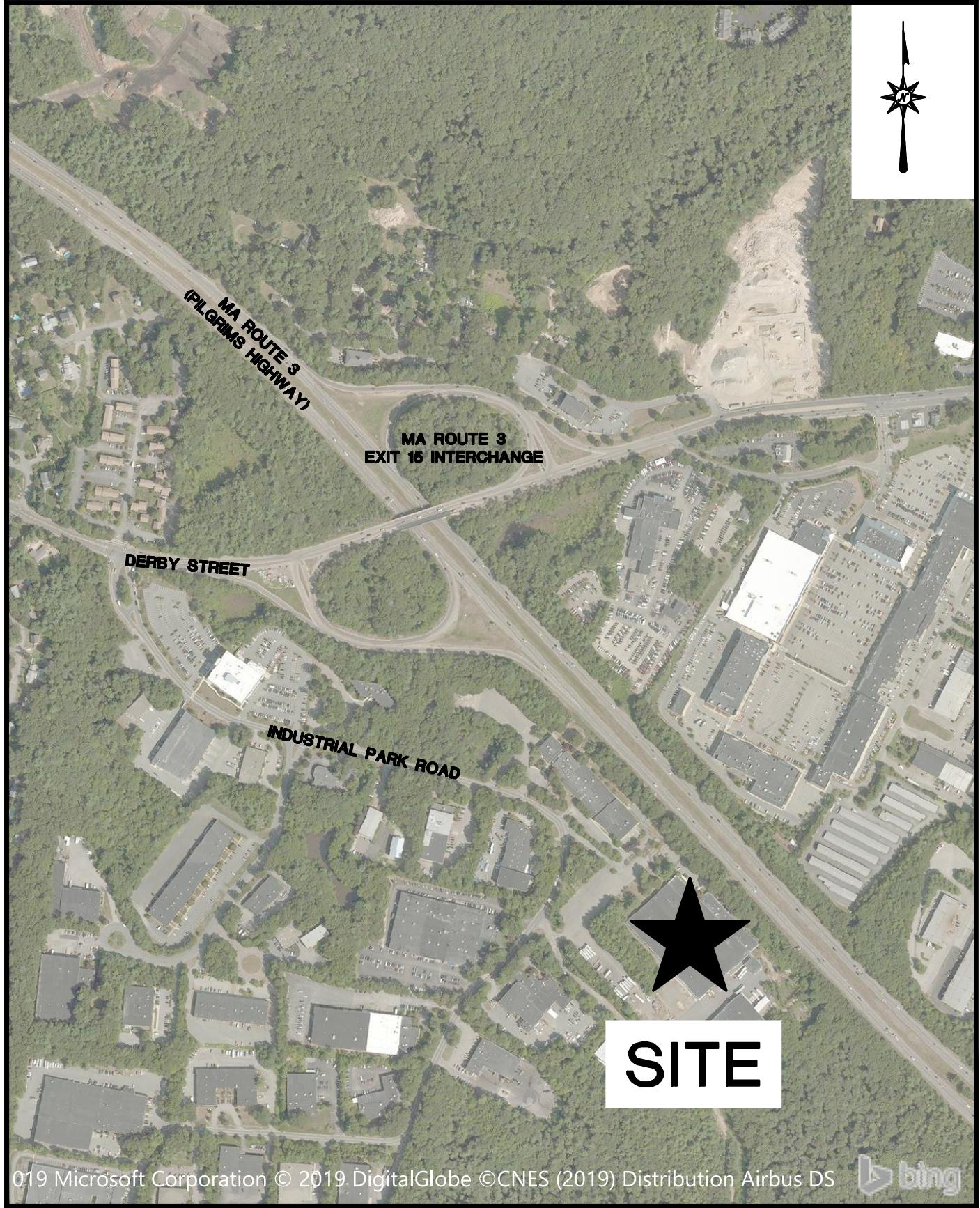
The level of traffic likely generated by the proposed development has been estimated by the tenant to determine the potential traffic impact on the study intersections. The tenant completed a detailed analysis determining the number and time of site traffic arrivals and departures at the site, which is a function of the delivery area population and business density. The proposed distribution station is projected to generate 109 (87 enter, 22 exit) vehicle trips during the weekday morning peak hour, 121 (60 enter, 61 exit) vehicle trips during the mid-day peak hour and 94 (42 enter, 52 exit) during the weekday evening peak hour.

A detailed traffic analysis was also conducted at key intersections and roadways in the general vicinity of the site in accordance with methodologies outlined in the Highway Capacity Manual 2010, published by the Transportation Research Board. The results of the analysis indicated that overall traffic operating conditions are acceptable at all the evaluated intersections during the peak hour periods analyzed between the No Build and Build scenarios. Any movement that does deteriorate in Level of Service between the No Build and Build scenarios in any of the peak hours is still projected to be within acceptable limits. The most significant queue increase between the No Build and Build scenarios is the Derby Street EB Thru movement in the AM Peak hour, where the queue length increases from 80' to 175'. For reference, the length of a vehicle and the space between itself and the next vehicle is approximately 25'.

I. INTRODUCTION

This traffic study has been prepared for a new tenant and change of use of an existing building at 100 Industrial Park Road in Hingham, MA. The focus of this study was to evaluate the traffic flows and operating conditions on the roadways and intersections projected to be used by motorists traveling to and from the proposed development and to quantify the potential traffic impacts on these roadways and intersections. The study area is primarily in a highway industrial park zone of Hingham and serves access to commercial properties. The site currently has an approximately ±149,000 SF building. The site will serve as a package delivery station which will provide “last mile” package delivery services to residences and businesses with an approximate 60-minute driving time radius of the See **Figure 1** for a location map.

The study investigated the potential traffic impacts associated with the development in the weekday morning, mid-day, and evening peak periods. There are three existing curb cuts to remain, two on Commerce Road and one on Industrial Park Road redevelopment of the site. The greatest cumulative impacts of project related traffic are likely to occur during the weekday morning, mid-day, and evening peak hours, when traffic consists mostly of commuters. As such, traffic operating conditions at the study intersections were analyzed during these peak periods.



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ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

LOCATION MAP
PROPOSED DEVELOPMENT
100 INDUSTRIAL PARK ROAD
HINGHAM, MASSACHUSETTS
NOT TO SCALE

FIGURE 1

II. EXISTING CONDITIONS

An investigation of the existing traffic conditions on the adjacent roadway network formed the basis for assessing any traffic issues associated with the proposed development. This investigation included a field reconnaissance, traffic counting, and research of pertinent planning and traffic data available with Massachusetts Department of Transportation (MassDOT) and the Town of Hingham.

Access Network

The project study area consists of the signalized intersection at the following locations:

- Derby Street at Pond Park Road

The following unsignalized intersections are also included as part of the study area:

- Industrial Park Road at Commerce Road
- Industrial Park Road at Site Drive North
- Derby Street at MA Route 3 SB Exit 15 On/ Off Ramps*
- Derby St. at MA Route 3 SB Exit 15 NB On/Off Ramps*

*At the time of this traffic study, these intersections are under reconstruction to be revised from unsignalized to signalized intersections under MassDOT Project No. 607309.

Major roadways in the vicinity of the project include Derby Street, Industrial Park Road, and the on and off ramps of the MA Route 3 interchange.

Derby Street is a minor arterial, extending from its intersection with Jason Lane to the west and terminating to the east at its intersection with MA Route 53. The roadway varies between two to five travel lanes with shoulder varying between two and ten feet. A posted speed limit of 25 mph is located approximately 450 feet west of Derby Street's intersection with Gardner Street. There is also a posted speed limit of 40 mph approximately 400 feet west of Derby Street's intersection with Pond Park Road. Annual Average Daily Traffic (AADT) counts were available at various locations along Derby Street. The peak AADT counts were located at the entrance to Derby Street Shoppes, approximately 800 feet east of Derby Street's intersection with Old

Derby Street with an AADT of approximately 31,900. AADT counts were recorded by MassDOT in 2018.

Industrial Park Road is a local roadway, extending from its intersection with Research Road to the west and terminating at its intersection with Pond Park Road to the north, where Pond Park Road becomes Industrial Park Road. The corridor consists of two travel lanes separated by a double yellow line. There exists two posted speed limits of 20 mph on Industrial Park Road. One is located immediately north of Industrial Park Road's intersection with Commerce Road, and another located approximately 400 feet west of Industrial Park Road's intersection with Site Drive North. There is no AADT information available for this roadway.

MA Route 3 Interchange On/Off Ramps serve access between Derby Street and MA Route 3. The two intersections of the NB and SB Ramps with Derby Street are approximately 750 feet apart. The intersection of Derby Street SB Ramps is approximately 350 feet east from the intersection of Derby Street and Park Road. The peak AADT count for the SB on/off ramps is located at the on-ramp with an AADT of approximately 24,500. The peak AADT count for the NB on/off ramps is located at the off-ramp with an AADT of approximately 31,100. AADT counts were recorded by MassDOT in 2018.

Intersection Characteristics

Several key intersections were reviewed in this study to determine if they would be impacted by the expected site traffic volumes. They are as follows:

Industrial Park Road at Commerce Road- At this unsignalized intersection there is no signage indicating that either Industrial Park Road or Commerce Road are stop-controlled. There is no lane delineation apparent on Commerce Road.

Industrial Park Road at Site Drive North- At this unsignalized intersection, Site Drive north is stop-controlled. There is no lane delineation apparent on-Site Drive North.

Derby Street at Pond Park Road and Private Drive- At this signalized intersection, the Pond Park Road approach has two travel lanes including an exclusive left turn lane. At the Derby Street eastbound approach there are two travel lanes and a signalized pedestrian crosswalk. Two travel lanes with one being an exclusive left turn exist at the Derby Street westbound approach. The fourth leg of this intersection provides access to a business park. Two travel lanes with one being an exclusive left turn exist at this approach. Derby Street westbound has a protected left turn phase with right turn overlap from Pond Park Road northbound. There is emergency pre-emption installed on all four approaches of this intersection. This signal is part of a coordinated system, with a 90" cycle length for the AM, mid-day and PM Peak hours.

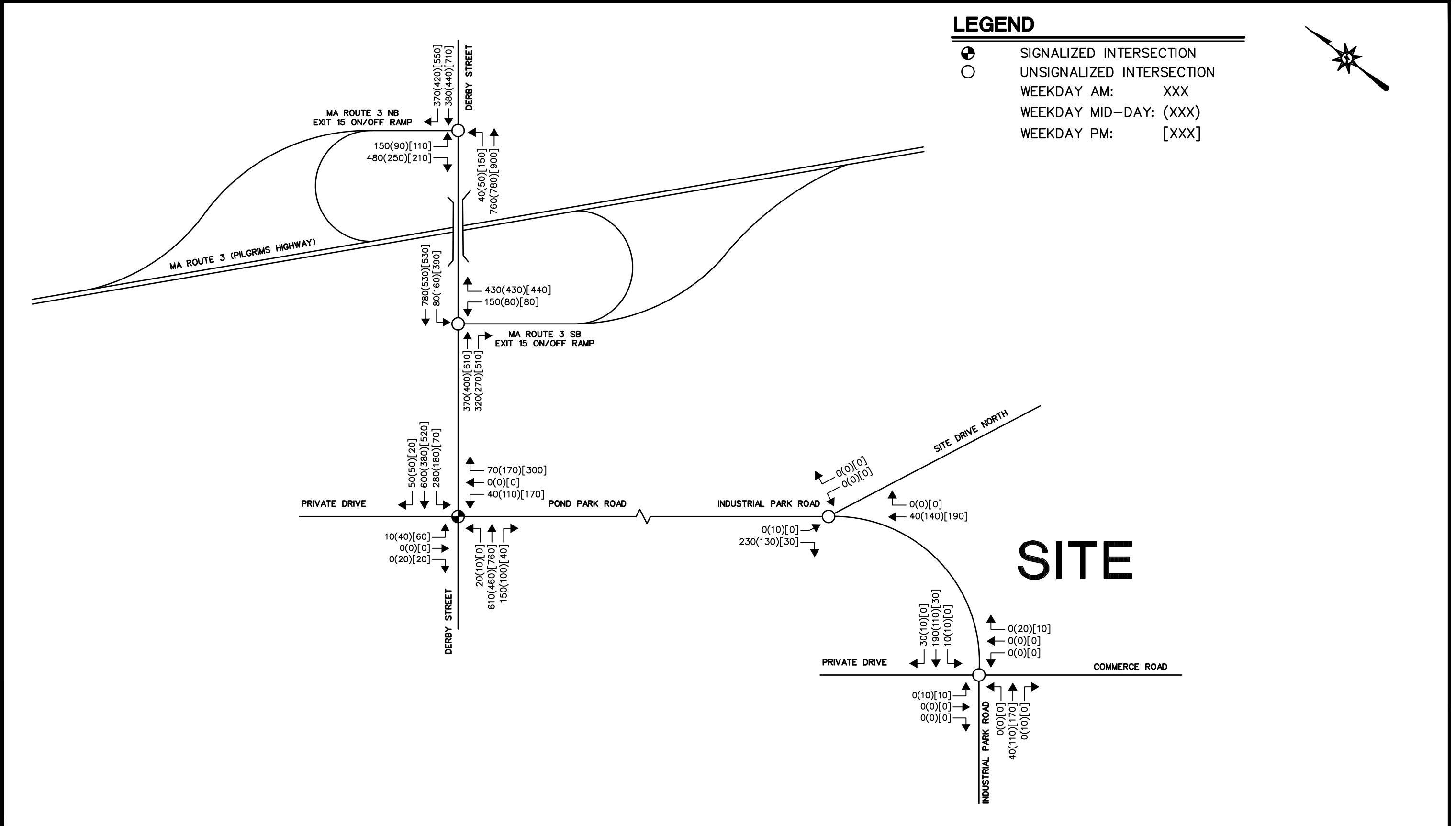
Derby Street at MA Route 3 SB Exit 15 SB On/Off Ramps- At this unsignalized intersection, MA Route 3 SB Off Ramp has a yield controlled channelized right turn providing access to MA Route 53. The SB off ramp is stop controlled. For the SB On Ramps, there exists both a channelized right turn to provide access to the Derby Street westbound traffic and a second ramp to provide access for the Derby Street eastbound traffic. A proposed signal is expected to be installed and completed at the intersection of Derby Street and MA Route 3 SB Exit 15 SB On/Off Ramps in the Spring of 2020 per MassDOT Project No. 607309.

Derby Street at MA Route 3 NB Exit 15 NB On/Off Ramps- At this unsignalized intersection, MA Route 3 NB Off Ramp has a yield controlled channelized right. The NB Off Ramp is stop controlled and provides access to MA Route 53. For the NB On Ramps, there exists both a channelized right turn to provide access to the Derby Street westbound traffic and a second ramp to provide access for the Derby Street eastbound traffic. A proposed signal is expected installed and completed at the intersection of Derby Street and MA Route 3 NB Exit 15 NB On/Off Ramps in the Spring of 2020 per MassDOT Project No. 607309.

Existing Traffic Volumes

To assess existing traffic conditions in the vicinity of the site, peak hour manual turning movement traffic volumes, vehicle classification and pedestrian counts were recorded at the intersections above. The counts were recorded during typical weekday morning (6am-9am), evening (4pm-6pm) and mid-day (11am-1pm) peak traffic periods in September of 2019.

A seasonal adjustment factor of 0.92 was applied to the September 2019 peak-hour count data to reflect average month conditions. The current peak hour traffic volumes for the intersections are illustrated in **Figure 2**.



Crash Data Analysis

As part of the existing conditions analysis, crash data for the most recent three and a half-year period, January 1st, 2016 through September 2019, was obtained using the Massachusetts Impact Crash Query and Visualization Tool.

Fifty-four (54) crashes in the study area were reviewed, the most common crashes were rear-end at forty-eight percent (48%). Majority of crashes resulted in “Property Damage Only (None Injured)” at seventy-two percent (72%). According to the MassDOT accident records mentioned above, the intersection of Derby St. at MA Route 3 SB Exit 15 SB On/Off Ramps experienced the majority of the crashes in the corridor at forty-three percent (43%). Below, **Table 1** summarizes the crash data.

MassDOT Project No. 607309 was implemented specifically because of the high crash rates in the corridor and at the ramps. The crash rates would expect to be reduced after construction.

Table 1 – Crash Data Summary

	Industrial Park Rd. at Commerce Rd.	Industrial Park Rd. at Site Drive North	Derby St. at MA Route 3 SB Exit 15 SB On/Off Ramps	Derby St. at Pond Park Rd and Private Drive	Derby St. at MA Route 3 SB Exit 15 NB On/Off Ramps
Year					
2016	0	0	9	1	3
2017	1	0	5	3	11
2018	0	0	9	4	7
2019	0	0	0	1	0
Total	1	0	23	9	21
Crash Type					
Angle	0	0	7	4	6
Head-On	0	0	2	0	1
Rear-end	0	0	11	3	12
Not Applicable	0	0	0	0	0
Other	0	0	0	0	0
Rear-to-Rear	0	0	0	0	0
Unknown	0	0	0	0	0
Single vehicle crash	1	0	1	1	1
Rear to Side	0	0	0	0	0
Sideswipe, Opposite Direction	0	0	1	0	1
Sideswipe, Same Direction	0	0	1	1	0
Total	1	0	23	9	21
Severity					
Fatal Injury	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0
Possible Injury	0	0	0	0	0
No Apparent Injury	0	0	0	0	0
Not Reported	0	0	0	2	0
Non-fatal injury	1	0	4	2	6
Property damage only (none injured)	0	0	19	5	15
Unknown	0	0	0	0	0
Total	1	0	23	9	21

Note: Data collected from Massachusetts Department of Transportation, IMPACT Crash Query and Visualization Tool

	Industrial Park Rd. at Commerce Rd.	Industrial Park Rd. at Site Drive North	Derby St. at MA Route 3 SB Exit 15 SB On/Off Ramps	Derby St. at Pond Park Rd and Private Drive	Derby St. at MA Route 3 SB Exit 15 NB On/Off Ramps
Conditions					
Clear	0	0	15	5	16
Cloudy	1	0	4	3	2
Fog	0	0	0	0	0
Rain	0	0	3	1	3
Snow	0	0	0	0	0
Sleet, hail (freezing rain or drizzle)	0	0	0	0	0
Unknown	0	0	1	0	0
Total	1	0	23	9	21

Note: Data collected from Massachusetts Department of Transportation, IMPACT Crash Query and Visualization Tool

III. PROJECTED TRAFFIC CONDITIONS

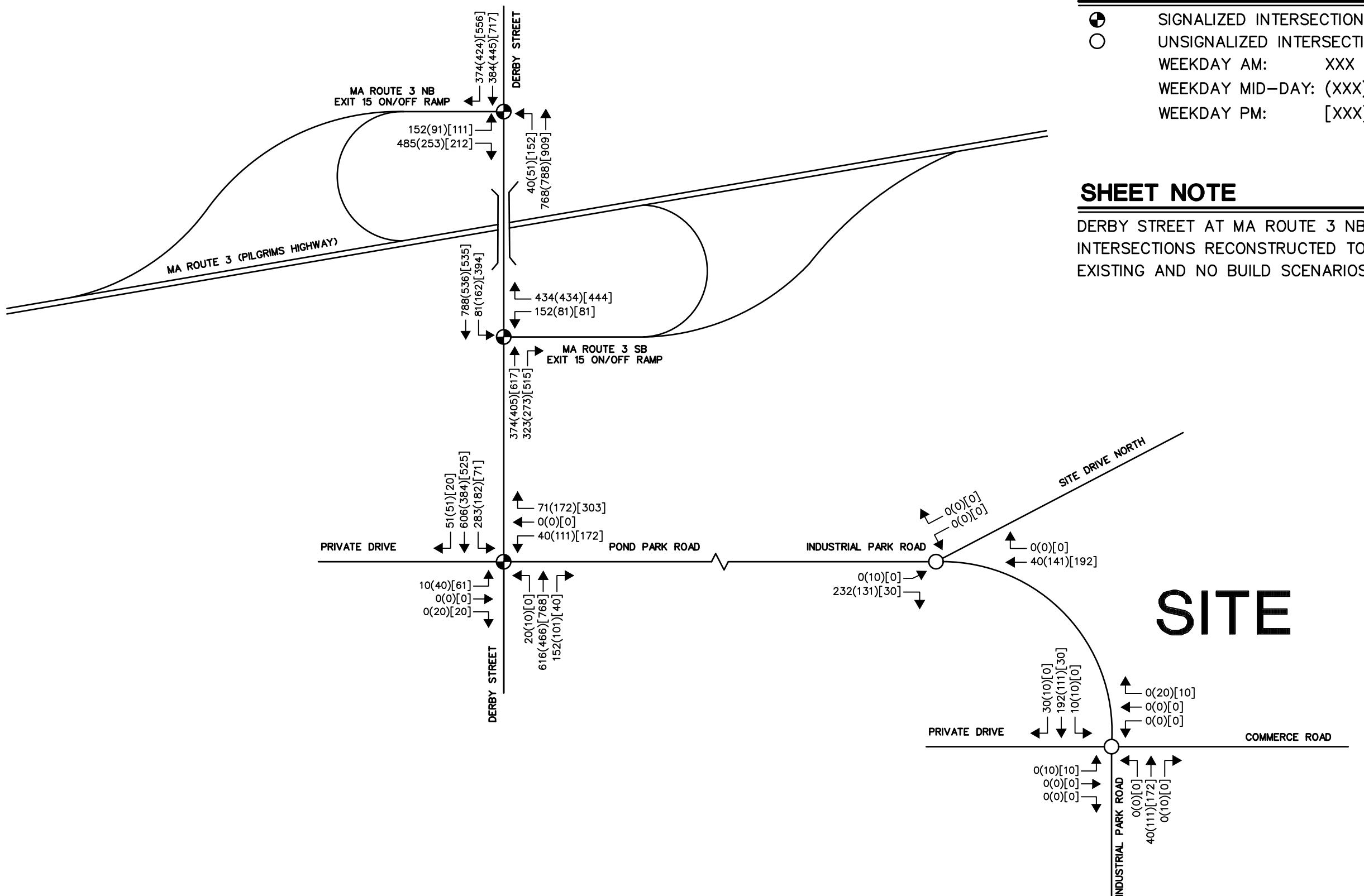
In order to evaluate traffic conditions when the proposed development is completed in 2020, future traffic volumes networks for forecast under the 2020 No Build Conditions (without the proposed distribution station development) and under 2020 Build Conditions (with the proposed distribution station development). The projected traffic volumes on the roadway network under 2020 No Build conditions were assumed to include all existing traffic and new traffic resulting from background sources of traffic growth, independent of the proposed development. The project traffic volumes on the roadway network under 2020 Build conditions were assumed to include the anticipated project site-generated traffic volumes in addition to the assumed background traffic growth.

No Build Traffic Volumes

A 1% annual growth rate was applied to the existing traffic volumes to develop the 2020 No Build traffic volumes. In addition to applying this growth rate, any approved or pending developments in the area that may add substantial traffic volume to the study intersections were considered. In our research, no such planned developments were uncovered. The annual growth volumes were added to the Existing Traffic Volumes to determine the No Build (2020) Traffic Volumes. **Figure 3** graphically illustrates the No Build Traffic Volumes.

Build Improvements

At the time of this traffic study, the two intersections of Derby Street at MA Route 3 NB On/Off Ramps and Derby Street at MA Route 3 SB On/Off Ramps were under reconstruction, revising the intersections from unsignalized to signalized intersections, according to MassDOT Project No. 607309. It is noted that the construction is anticipated to be completed before the opening of this development, so the revisions to these intersections is reflected in the No Build and Build analysis of the study area.



NO BUILD (2020) TRAFFIC VOLUMES
PROPOSED DEVELOPMENT
100 INDUSTRIAL PARK ROAD
HINGHAM, MASSACHUSETTS
SCHEMATIC, NOT TO SCALE

Trip Generation and On-Site Circulation

The level of traffic likely generated by the proposed delivery station has been estimated by the tenant to determine the potential traffic impact on the study intersections. The tenant completed a detailed analysis determining the number and time of site traffic arrivals and departures at the site, which is a function of the delivery area population and business density.

The Tenant anticipates that this facility will employ approximately 118 associates/managers on-site over various shifts during the course of the day. All associates/managers will utilize the existing access on Industrial Park Road.

In addition to the associates/managers working in the facility, the tenant expects that 336 delivery service partner (DSP) and 38 flex drivers will be utilized for daily package deliveries within and approximately 60-minute radius of the facility. Flex drivers will arrive on-site mid-day (three shifts of 9 drivers between 11:15 a.m. and 12:45 p.m. and two shifts of 5 drivers between 2:00 and 3:00 p.m.) through the existing site drive on Commerce Road. The flex drivers enter the building in their personal vehicle, the vehicle will be loaded and then the flex drivers will leave via Commerce Road and make deliveries in their personal vehicles.

DSP drivers will arrive on-site in the morning (four shifts of 20 drivers between 7:30 and 10:00 a.m.) through the existing site drive on Commerce Road. The DSP drivers will park their personal vehicles on-site and then leave the site in a delivery van, exiting through the existing site drive on Fordham Road. The first set of 20 vans will be pre-loaded within the building overnight so that the first wave of DSP drivers arrives on-site and leave quickly. Subsequent shifts of vans will enter the building, get loaded and then proceed out for deliveries. As DSP drivers finish their deliveries, they return to the site via Commerce Road, park the delivery vans and leave the site in their personal vehicles (four shifts of 20 drivers between 4:45 and 6:15 p.m.)

The site is expected to process 10 tractor-trailers per day, generally between 9:00 p.m. and 2:00 a.m. Tractor trailers will enter and exit on Commerce Road.

A summary of the trip generation projections for the proposed distribution station is presented in **Table 2**. As indicated in this table, the proposed distribution station is projected to generate 109 (87 enter, 22 exit) vehicle trips during the weekday morning peak hour, 121 (60 enter, 61 exit)

vehicle trips during the mid-day peak hour and 94 (42 enter, 52 exit) during the weekday evening peak hour.

Table 2 – Peak Hour Trip Generation

Trips By	Trips								
	AM Peak Hour Adjacent Street Traffic			Mid-day Peak Hour Adjacent Street Traffic			PM Peak Hour Adjacent Street Traffic		
	Total	In	Out	Total	In	Out	Total	In	Out
Associates/Managers	43	43	0	22	0	22	10	0	10
DSP	63	42	21	63	42	21	84	42	42
Flex Drivers	0	0	0	36	18	18	0	0	0
Trucks	3	2	1	0	0	0	0	0	0
Net New Trips	109	87	22	121	60	61	94	42	52

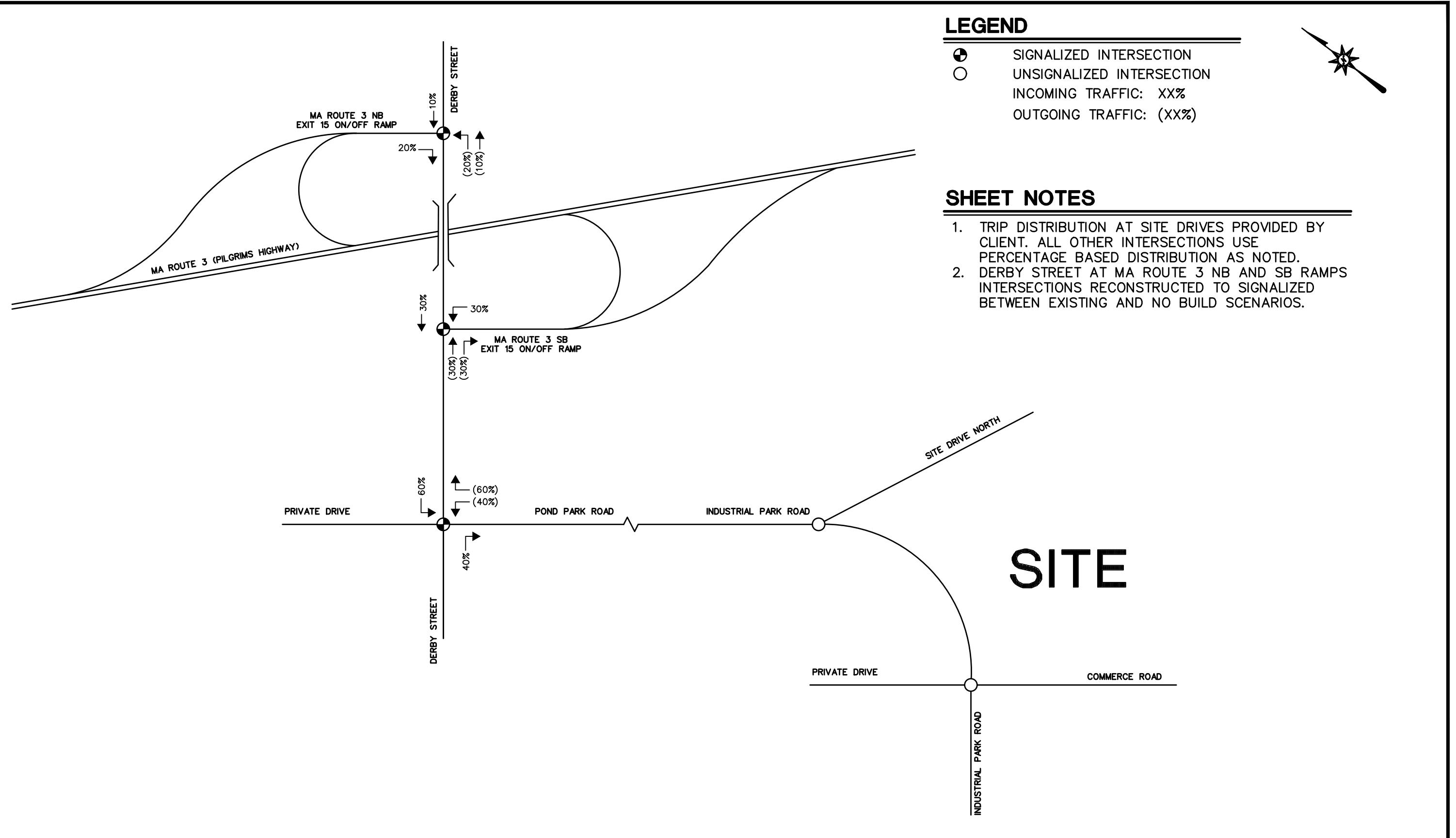
Trip Distribution

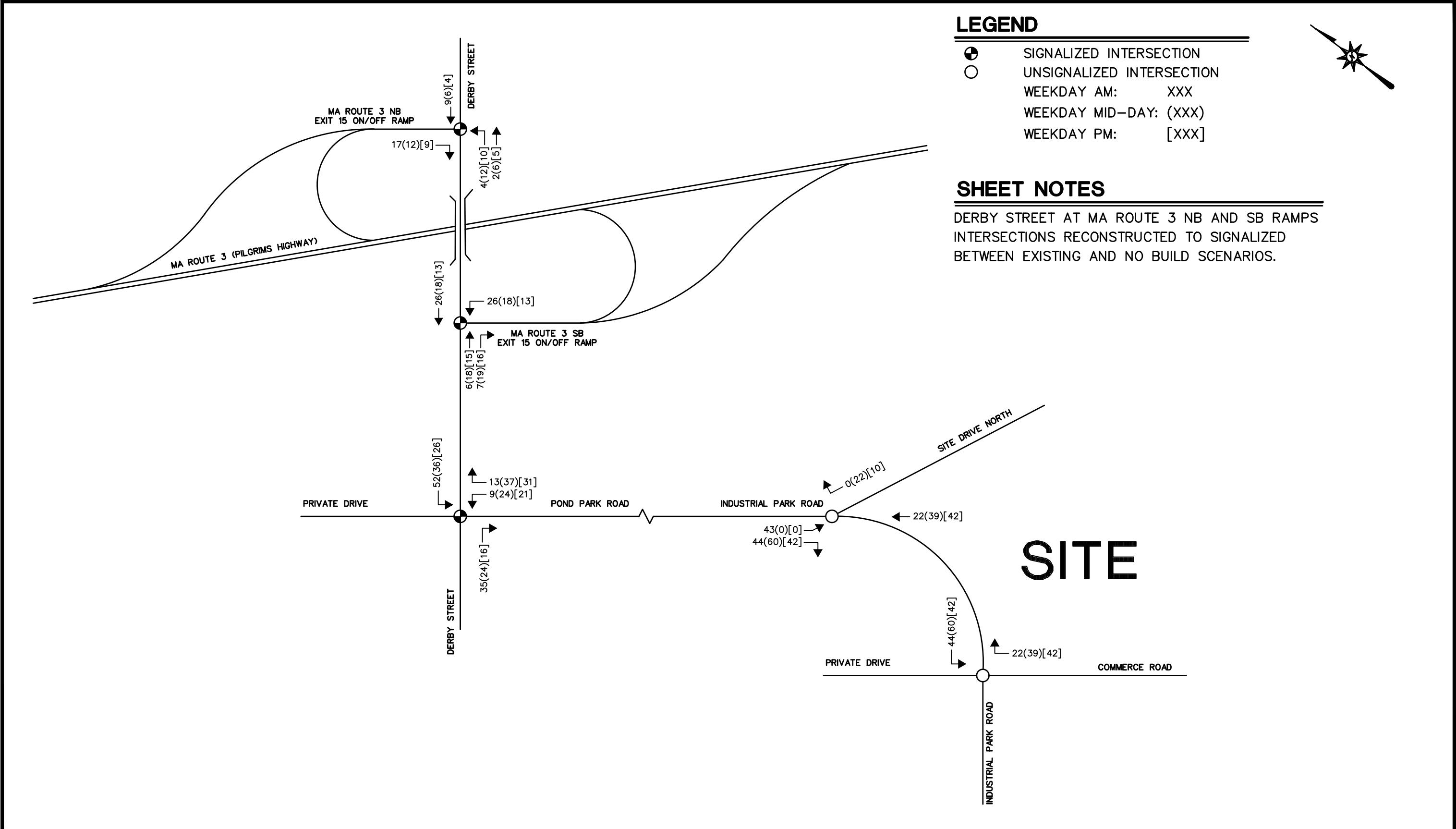
The directional distribution of traffic is typically a function of population densities, competing opportunities, existing travel patterns adjacent to the site, and the efficiency and limitations of the existing roadway system. Based upon the site's close proximity to MA Route 3 (Pilgrims Highway), it is anticipated that the majority of employees/delivery vehicles will utilize this route for access and egress from the site. The distribution of the anticipated traffic volumes was based on arrival/departure patterns shown in **Figure 4**.

Assigned Site Generated Traffic Volumes

The generated trips are multiplied by the corresponding proportions to ascertain the site-generated traffic volumes.

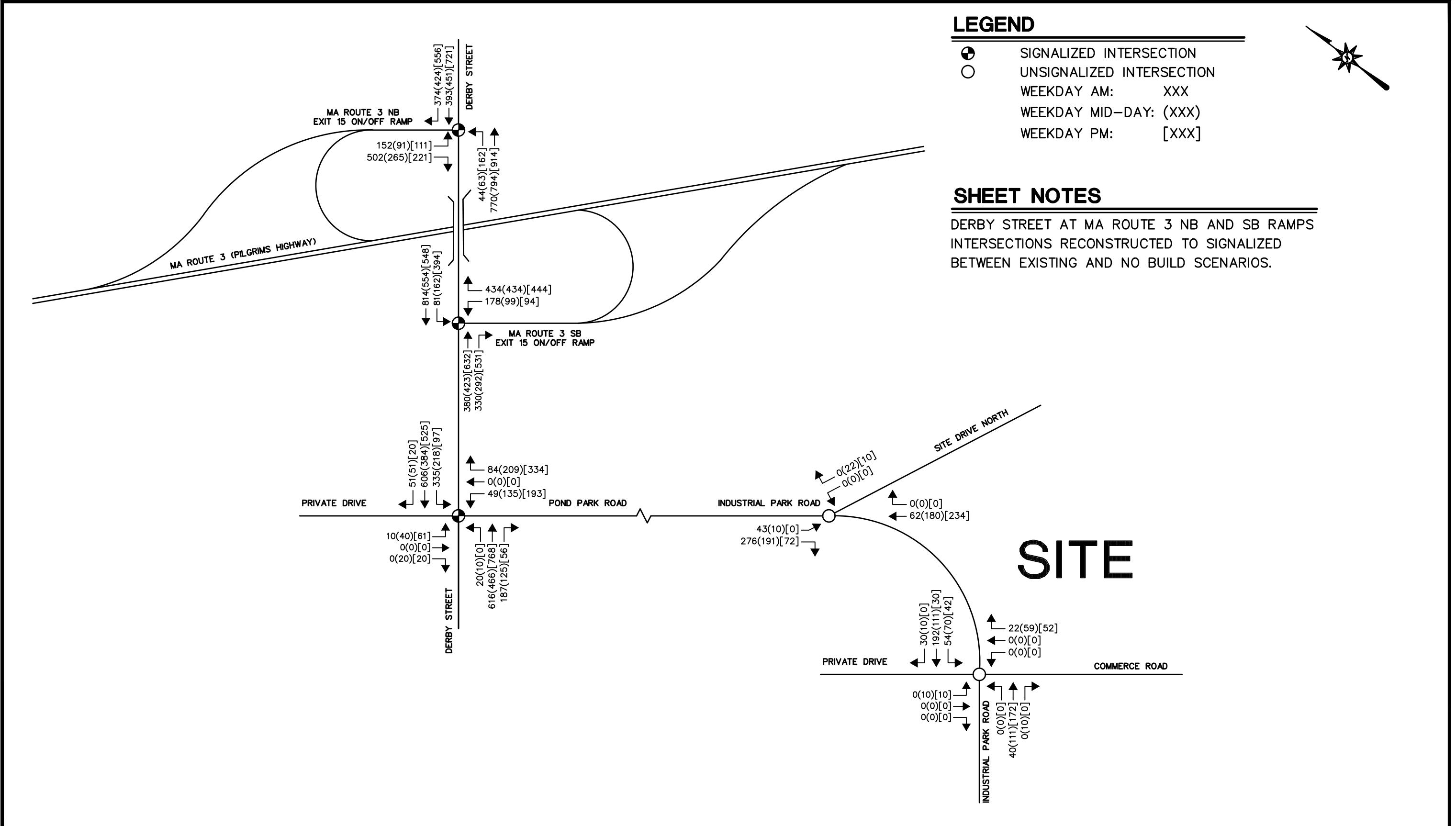
Figure 5 shows the site generated peak hour traffic generated by the site assigned to the nearby roadway network.





Build Traffic Volumes

The assigned site-generated traffic volumes were superimposed onto the No Build Traffic volumes to establish the future Build Traffic volumes, as illustrated in **Figure 6**.



IV. ROADWAY ADEQUACY

The intersection capacity analyses were prepared using the methodology described in the Highway Capacity Manual (HCM), published by the Transportation Research Board (TRB) for the existing and build traffic volume scenarios to simulate the traffic impact of a proposed Delivery Station on the adjacent roadway network. As documented in the HCM, intersection performance is influenced by a number of factors, including: traffic demand; lane configurations; lane widths; turning restrictions; roadway grades; and signal phasing. The existing physical roadway characteristics and signal phasing and timing settings were determined by observing conditions in the field and reviewing the current traffic control signal plans provided by MassDOT and the Town of Hingham.

Synchro™ software (Version 10) was used to model the study intersections based on the parameters mentioned above. The Synchro software is widely utilized by the traffic engineering industry and is consistent with the procedures in the HCM.

Signalized Intersections

Signalized intersections are analyzed in terms of vehicle capacity and motorist delay. Capacity is the maximum rate of vehicle flow through an intersection given typical operating conditions. The number of vehicles traveling through an intersection is divided by the capacity of the intersection to determine an overall volume to capacity ratio (v/c). A v/c value under 1.00 indicates that the number of vehicles traveling through an intersection is less than capacity.

As stated in the HCM, level of service for signalized intersections is defined in terms of control delay. Control delay measures the increase in delay a motorist experiences while encountering a traffic control signal. These factors include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. This delay is measured per vehicle for a 15-minute analysis period and is associated with the levels of service, which are summarized in **Table 3** below:

Table 3 – Signalized Intersection – Level of Service

<u>Level of Service</u>	<u>Average Control Delay (seconds per vehicle)</u>
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Level of service A represents the optimum level where most motorists arrive at the subject intersection during the green phase and thus experience virtually no delay. Conversely, level of service F indicates that motorists are delayed over 80 seconds while traveling through the intersection, and can often imply a complete breakdown of that location. Level of service D is generally considered the limit of acceptable motorist delay.

Unsignalized Intersections

Unsignalized intersections are generally evaluated in terms of average side street delay, as well as the capacity of the roadway approach. This analysis is based on the random arrival of vehicles and the associated gaps generated by this random arrival within the traffic stream. There is no overall level of service for unsignalized intersections. The relationship between levels of service and average side street delay are summarized in **Table 4** below:

Table 4 – Unsignalized Intersection – Level of Service

<u>Level of Service</u>	<u>Average Control Delay (seconds per vehicle)</u>
A	≤ 10
B	$> 10 \text{ and } \leq 15$
C	$> 15 \text{ and } \leq 25$
D	$> 25 \text{ and } \leq 35$
E	$> 35 \text{ and } \leq 50$
F	> 50

It should be noted that unsignalized levels of service do not correspond to those for signalized intersections, nor do they constitute warrants for the installation of traffic control signals. It is also recognized that the methodology is overly conservative and that computations can indicate operations at poor levels of service (E or F) with even very low side street volumes, although they often function without serious problems in the real world.

Table 5 shows the levels of service (LOS) at the subject intersections. A more detailed table is included in the Appendix.

Table 5 – Peak Hour Levels of Service

	<u>AM</u>		<u>Mid-Day</u>		<u>PM</u>	
	<u>No Build</u>	<u>Build</u>	<u>No Build</u>	<u>Build</u>	<u>No Build</u>	<u>Build</u>
Derby Street at MA Route 3 NB Exit 15 On/Off Ramps¹	B/13.9	B/14.6	B/10.7	B/10.9	B/10.3	B/10.4
Derby Street EB Left	A/0.07/25	A/0.08/30	A/0.09/35	A/0.12/40	A/0.34/50	A/0.37/55
Derby Street EB Thru	A/0.38/80	A/0.39/175	A/0.36/165	A/0.36/170	A/0.40/135	A/0.40/130
Derby Street WB Thru	C/0.29/145	C/0.31/150	B/0.26/120	B/0.27/125	B/0.41/185	B/0.42/190
Derby Street WB Right ³	-	-	-	-	-	-
MA Route 3 NB Exit 15 SB Left	C/0.20/65	C/0.20/65	C/0.16/45	C/0.16/45	C/0.24/60	C/0.23/60
MA Route 3 NB Exit 15 SB Right	C/0.73/275	C/0.74/290	C/0.52/190	C/0.54/195	C/0.45/165	C/0.46/170
<hr/>						
Derby Street at MA Route 3 SB Exit 15 On/Off Ramps¹	B/14.9	B/15.8	B/13.7	B/13.7	B/17.5	B/18.0
Derby Street EB Thru	C/0.40/155	B/0.36/60	C/0.33/165	C/0.35/170	A/0.34/235	C/0.50/245
Derby Street EB Right ³	-	-	-	-	-	-
Derby Street WB Left	A/0.10/25	A/0.11/45	A/0.22/60	A/0.23/60	B/0.41/260	C/0.65/265
Derby Street WB Thru	B/0.66/440	B/0.69/510	A/0.45/185	A/0.46/185	A/0.54/260	B/0.46/275
MA Route 3 SB Exit 15 NB Left	D/0.54/145	D/0.61/160	C/0.29/85	D/0.36/105	C/0.24/85	C/0.33/95
MA Route 3 SB Exit 15 NB Right	A/0.29/85	B/0.31/150	B/0.34/90	B/0.34/95	C/0.45/125	B/0.36/125

Overall Intersection – X/XX.X - Level of Service/Intersection Signal Delay in sec**Approaches - X/X.XX/XXX – Level of Service/Volume to Capacity Ratio/95% Queue Length in ft**¹ – Signalized Intersection² – Unsignalized intersection, Analysis for controlled movement³ – Channelized movement, Unsignalized

	AM		Mid-Day		PM	
	<u>No Build</u>	<u>Build</u>	<u>No Build</u>	<u>Build</u>	<u>No Build</u>	<u>Build</u>
Pond Park Road at Private Drive and Derby Street¹	A/8.8	B/11.3	B/11.6	B/12.8	B/16.5	B/17.4
Derby Street EB Left/Thru/Right	B/0.43/210	B/0.49/260	B/0.35/165	B/0.39/190	B/0.48/265	B/0.51/260
Derby Street WB Left	A/0.57/125	B/0.65/190	A/0.34/60	A/0.43/75	A/0.20/35	A/0.28/40
Derby Street WB Thru/Right	A/0.48/185	A/0.48/320	A/0.36/115	A/0.37/105	A/0.48/140	A/0.50/135
Pond Park Road NB Left/Thru	D/0.33/55	D/0.38/65	D/0.60/115	D/0.63/130	D/0.68/155	D/0.72/175
Pond Park Road NB Right	A/0.17/30	A/0.17/30	A/0.30/40	A/0.32/40	B/0.52/145	B/0.56/175
Private Drive SB Left/Thru	D/0.09/25	D/0.08/25	C/0.23/50	C/0.21/50	C/0.31/65	C/0.31/65
Private Drive SB Right	A/0.00/25	A/0.00/25	A/0.07/25	A/0.06/25	A/0.05/25	A/0.05/25
Industrial Park Road at Site Drive North³	-	-	-	-	-	-
Industrial Park Road EB Thru/Right	-	-	-	-	-	-
Site Drive North WB Left/Thru	A/0.00/25	A/0.00/25	A/0.00/25	A/0.00/25	A/0.00/25	A/0.00/25
Industrial Park Road NB Left/Right	-	-	-	-	-	-
Industrial Park Road at Site Drive South and Private Drive³	-	-	-	-	-	-
Private Drive SE Left/Thru/Right	A/0.00/25	A/0.02/25	B/0.02/25	B/0.02/25	B/0.02/25	B/0.02/25
Site Drive South NW Left/Thru/Right	A/0.00/25	A/0.00/25	A/0.02/25	A/0.07/25	A/0.01/25	A/0.07/25
Industrial Park Road NE Left/Thru/Right	-	-	-	-	-	-
Industrial Park SW Left/Thru/Right	-	-	-	-	-	-

Overall Intersection – X/XX.X - Level of Service/Intersection Signal Delay in sec

Approaches - X/X.XX/XXX - Level of Service/Volume to Capacity Ratio/95% Queue Length in ft

¹ – Signalized Intersection

² – Unsignalized intersection, Analysis for controlled movement

³ – Channelized movement, Unsignalized

As illustrated in **Table 5**, traffic operations for the overall intersection LOS for the signalized intersections are projected to operate at an acceptable LOS between the No Build and Build scenarios amongst the three peak hours. Any movement that does deteriorate between the No Build and Build scenarios, stays within the acceptable limit Level of Service. The most significant queue increase between the No Build and Build scenarios is the Derby Street EB Thru movement in the AM Peak hour, where the queue length increases from 80' to 175'. For reference, the length of a vehicle and the space between itself and the next vehicle is approximately 25'. Although the queue length approximately doubles, the movement level of service remains an "A" between the No Build and Build scenarios. One overall intersection LOS that deteriorates is the Pond Park Road at Private Drive and Derby Street, but it only deteriorates from an "A" to "B" Level of Service.

V. CONCLUSIONS AND RECOMMENDATIONS

This traffic study has been prepared for a new tenant and change of use of an existing building at 100 Industrial Park Road in Hingham, MA. The focus of this study was to evaluate the traffic flows and operating conditions on the roadways and intersections projected to be used by motorists traveling to and from the proposed development and to quantify the potential traffic impacts on these roadways and intersections the proposed distribution station is projected to generate 109 (87 enter, 22 exit) vehicle trips during the weekday morning peak hour, 121 (60 enter, 61 exit) vehicle trips during the mid-day peak hour and 94 (42 enter, 52 exit) during the weekday evening peak hour. After analyses of the No Build and Build Scenarios of the AM, Mid-Day and PM Peak Hours, no Build Improvements were determined to be necessary.

APPENDIX

CAPACITY ANALYSES

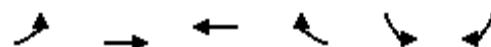
NO BUILD

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

No Build Improvements

Timing Plan: AM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	40	768	384	374	152	485
Future Volume (vph)	40	768	384	374	152	485
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165			0	140	0
Storage Lanes	1			1	2	1
Taper Length (ft)	100				250	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.419				0.950	
Satd. Flow (perm)	780	3539	3539	1583	3433	1583
Right Turn on Red				Yes		No
Satd. Flow (RTOR)				407		
Link Speed (mph)		30	40		30	
Link Distance (ft)		274	566		547	
Travel Time (s)		6.2	9.6		12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	835	417	407	165	527
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	835	417	407	165	527
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	4 5
Switch Phase						
Minimum Initial (s)	6.0	10.0	10.0	10.0	6.0	
Minimum Split (s)	13.0	17.0	17.0	17.0	12.0	
Total Split (s)	31.0	78.0	47.0	47.0	12.0	
Total Split (%)	34.4%	86.7%	52.2%	52.2%	13.3%	
Maximum Green (s)	24.0	71.0	40.0	40.0	6.0	
Yellow Time (s)	4.5	5.0	5.0	5.0	3.0	
All-Red Time (s)	2.5	2.0	2.0	2.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	None	None	None	
Act Effect Green (s)	55.3	55.3	36.0	36.0	21.7	41.0
Actuated g/C Ratio	0.61	0.61	0.40	0.40	0.24	0.46
v/c Ratio	0.07	0.38	0.29	0.46	0.20	0.73
Control Delay	4.5	5.4	20.7	4.6	27.6	25.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.5	5.4	20.7	4.6	27.6	25.9
LOS	A	A	C	A	C	C
Approach Delay		5.3	12.7		26.3	
Approach LOS		A	B		C	

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

No Build Improvements

Timing Plan: AM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	5	55	79	0	38	247
Queue Length 95th (ft)	12	76	145	68	65	271
Internal Link Dist (ft)		194	486		467	
Turn Bay Length (ft)	165				140	
Base Capacity (vph)	743	2791	1598	938	827	926
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.30	0.26	0.43	0.20	0.57

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 78 (87%), Referenced to phase 2:EBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 13.9

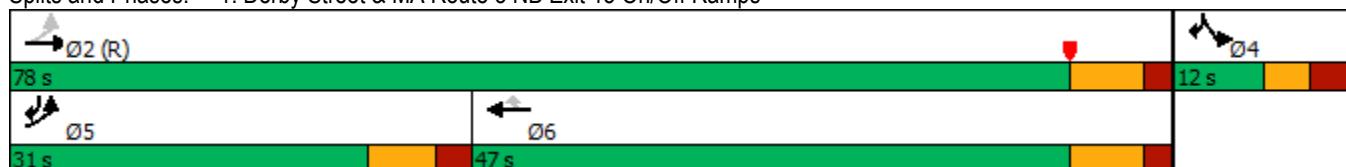
Intersection LOS: B

Intersection Capacity Utilization 51.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

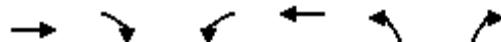


Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

No Build Improvements

Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations	↑↑		↑	↑	↑	↑↑	
Traffic Volume (vph)	374	0	81	788	152	434	
Future Volume (vph)	374	0	81	788	152	434	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)			0	120		0	0
Storage Lanes			0	1		1	2
Taper Length (ft)				100		25	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	0.88	
Frt						0.850	
Flt Protected				0.950		0.950	
Satd. Flow (prot)	3539	0	1770	1863	1770	2787	
Flt Permitted				0.373		0.950	
Satd. Flow (perm)	3539	0	695	1863	1770	2787	
Right Turn on Red		Yes				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			40		30	
Link Distance (ft)	144			854		302	
Travel Time (s)	3.3			14.6		6.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	407	0	88	857	165	472	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	407	0	88	857	165	472	
Turn Type	NA		pm+pt	NA	Prot	pt+ov	
Protected Phases	2		1	16	3	31	6
Permitted Phases			16				
Detector Phase	2		1	16	3	31	
Switch Phase							
Minimum Initial (s)	10.0		6.0	6.0		10.0	
Minimum Split (s)	15.5		11.5	12.0		15.5	
Total Split (s)	53.0		17.0	20.0		70.0	
Total Split (%)	58.9%		18.9%	22.2%		78%	
Maximum Green (s)	47.5		11.5	14.0		64.5	
Yellow Time (s)	4.5		4.5	3.5		4.5	
All-Red Time (s)	1.0		1.0	2.5		1.0	
Lost Time Adjust (s)	0.0		0.0	0.0			
Total Lost Time (s)	5.5		5.5	6.0			
Lead/Lag	Lag		Lead				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0		3.0	
Recall Mode	C-Min		None	None		C-Min	
Act Effect Green (s)	26.1		63.0	63.0	15.5	52.4	
Actuated g/C Ratio	0.29		0.70	0.70	0.17	0.58	
v/c Ratio	0.40		0.10	0.66	0.54	0.29	
Control Delay	22.7		4.0	10.4	40.6	9.3	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	22.7		4.0	10.4	40.6	9.3	
LOS	C		A	B	D	A	
Approach Delay	22.7			9.8	17.4		
Approach LOS	C			A	B		

Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

No Build Improvements

Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Queue Length 50th (ft)	107		7	248	88	64	
Queue Length 95th (ft)	155		m22	436	142	83	
Internal Link Dist (ft)	64			774	222		
Turn Bay Length (ft)				120			
Base Capacity (vph)	1867		861	1340	309	1591	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.22		0.10	0.64	0.53	0.30	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 50 (56%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

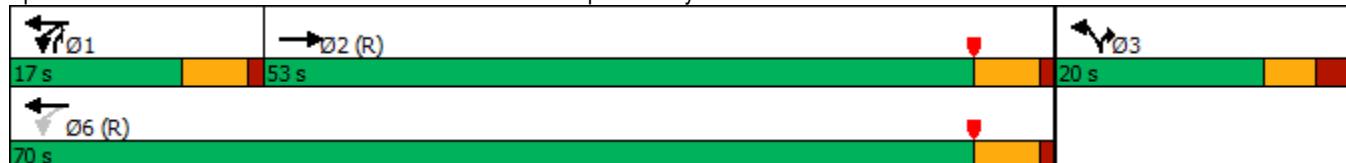
Intersection Signal Delay: 14.9 Intersection LOS: B

Intersection Capacity Utilization 59.5% ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street



Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

No Build Improvements

Timing Plan: AM PEAK

	→	→	→	←	←	↑	↑	↓	↓	↑	↑	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	616	152	283	606	51	40	0	71	10	0	0
Future Volume (vph)	20	616	152	283	606	51	40	0	71	10	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	270		0	0	0	0	0	0	0	0
Storage Lanes	0	0	1		0	0	1	1	0	1		
Taper Length (ft)	25		80			25			25			
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.971			0.988				0.850			
Flt Protected		0.999		0.950			0.950			0.950		
Satd. Flow (prot)	0	3433	0	1770	1840	0	0	1770	1583	0	1770	1863
Flt Permitted		0.927		0.264			0.750			0.729		
Satd. Flow (perm)	0	3186	0	492	1840	0	0	1397	1583	0	1358	1863
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43		14					77			
Link Speed (mph)		40		40			25			25		
Link Distance (ft)		530		374			328			180		
Travel Time (s)		9.0		6.4			8.9			4.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	670	165	308	659	55	43	0	77	11	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	857	0	308	714	0	0	43	77	0	11	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA	Prot
Protected Phases		2		1	6			8	18		4	4
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8	18	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	16.0	16.0		12.0	16.0		12.0	12.0		12.0	12.0	12.0
Total Split (s)	48.0	48.0		26.0	74.0		16.0	16.0		16.0	16.0	16.0
Total Split (%)	53.3%	53.3%		28.9%	82.2%		17.8%	17.8%		17.8%	17.8%	17.8%
Maximum Green (s)	42.0	42.0		20.0	68.0		10.0	10.0		10.0	10.0	10.0
Yellow Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0			0.0			0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0		6.0			6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None
Act Effect Green (s)	55.3		72.0	73.2			8.4	22.7			8.4	
Actuated g/C Ratio	0.61	0.80	0.81			0.09	0.25		0.09			
v/c Ratio	0.43	0.57	0.48			0.33	0.17		0.09			
Control Delay	11.1	8.2	4.0			44.4	6.0		37.4			
Queue Delay	0.0	0.0	0.0			0.0	0.0		0.0			
Total Delay	11.1	8.2	4.0			44.4	6.0		37.4			
LOS	B	A	A			D	A		D			
Approach Delay	11.1		5.3			19.7			37.4			
Approach LOS	B		A			B			D			

Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

No Build Improvements

Timing Plan: AM PEAK



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		124		23	84			23	0		6	
Queue Length 95th (ft)		208		124	185			54	28		21	
Internal Link Dist (ft)		450			294			248			100	
Turn Bay Length (ft)				270								
Base Capacity (vph)		1974		678	1505			159	570		154	
Starvation Cap Reductn		0		0	0			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.43		0.45	0.47			0.27	0.14		0.07	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 18 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.8

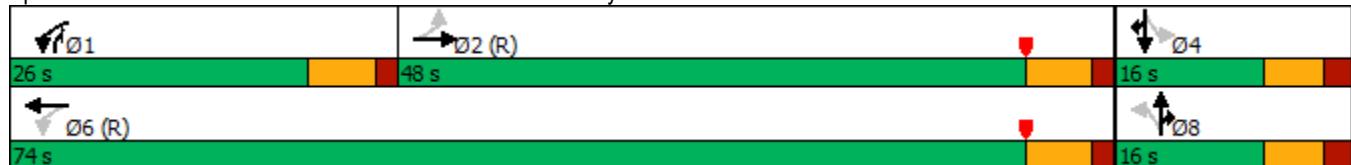
Intersection LOS: A

Intersection Capacity Utilization 81.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Pond Park Road/Private Drive & Derby Street



Lanes, Volumes, Timings
4: Industrial Park Road & Site Drive North

No Build Improvements
Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Volume (vph)	0	232	0	0	40	0
Future Volume (vph)	0	232	0	0	40	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t	0.865					
Flt Protected					0.950	
Satd. Flow (prot)	1611	0	0	1863	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	1611	0	0	1863	1770	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1962			409	430	
Travel Time (s)	44.6			9.3	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	252	0	0	43	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	252	0	0	0	43	0
Sign Control	Free			Stop	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 24.4%

ICU Level of Service A

Analysis Period (min) 15

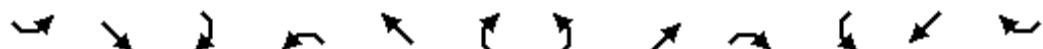
Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑		↔	↔		
Traffic Vol, veh/h	0	232	0	0	40	0
Future Vol, veh/h	0	232	0	0	40	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	252	0	0	43	0
Major/Minor	Major1	Minor2				
Conflicting Flow All	0	0	126	252		
Stage 1	-	-	0	0		
Stage 2	-	-	126	252		
Critical Hdwy	-	-	6.42	6.52		
Critical Hdwy Stg 1	-	-	-	-		
Critical Hdwy Stg 2	-	-	5.42	5.52		
Follow-up Hdwy	-	-	3.518	4.018		
Pot Cap-1 Maneuver	-	-	869	651		
Stage 1	-	-	-	-		
Stage 2	-	-	900	698		
Platoon blocked, %	-	-				
Mov Cap-1 Maneuver	-	-	869	0		
Mov Cap-2 Maneuver	-	-	869	0		
Stage 1	-	-	-	0		
Stage 2	-	-	900	0		
Approach	EB	WB				
HCM Control Delay, s	0	0				
HCM LOS		A				
Minor Lane/Major Mvmt	EBT	EBRWBLn1				
Capacity (veh/h)	-	-	-			
HCM Lane V/C Ratio	-	-	-			
HCM Control Delay (s)	-	-	0			
HCM Lane LOS	-	-	A			
HCM 95th %tile Q(veh)	-	-	-			

Lanes, Volumes, Timings

5: Industrial Park Road & Site Drive South/Private Drive

No Build Improvements

Timing Plan: AM PEAK



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	0	40	0	10	192	30
Future Volume (vph)	0	0	0	0	0	0	0	40	0	10	192	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt												0.982
Flt Protected												0.998
Satd. Flow (prot)	0	1863	0	0	1863	0	0	1863	0	0	1826	0
Flt Permitted												0.998
Satd. Flow (perm)	0	1863	0	0	1863	0	0	1863	0	0	1826	0
Link Speed (mph)		30				30			25			30
Link Distance (ft)		219				497			303			430
Travel Time (s)		5.0				11.3			8.3			9.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0	0	43	0	11	209	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	0	43	0	0	253	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 22.5%

ICU Level of Service A

Analysis Period (min) 15

Intersection													
Int Delay, s/veh	0.3												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR	
Lane Configurations	+	+	+	+	+	+	+	+	+	+	+	+	
Traffic Vol, veh/h	0	0	0	0	0	0	0	40	0	10	192	30	
Future Vol, veh/h	0	0	0	0	0	0	0	40	0	10	192	30	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	
Mvmt Flow	0	0	0	0	0	0	0	43	0	11	209	33	
Major/Minor	Minor2		Minor1		Major1		Major2						
Conflicting Flow All	291	291	226	291	307	43	242	0	0	43	0	0	
Stage 1	248	248	-	43	43	-	-	-	-	-	-	-	
Stage 2	43	43	-	248	264	-	-	-	-	-	-	-	
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-	
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-	
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-	
Pot Cap-1 Maneuver	661	619	813	661	607	1027	1324	-	-	1566	-	-	
Stage 1	756	701	-	971	859	-	-	-	-	-	-	-	
Stage 2	971	859	-	756	690	-	-	-	-	-	-	-	
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-	
Mov Cap-1 Maneuver	657	614	813	657	602	1027	1324	-	-	1566	-	-	
Mov Cap-2 Maneuver	657	614	-	657	602	-	-	-	-	-	-	-	
Stage 1	756	695	-	971	859	-	-	-	-	-	-	-	
Stage 2	971	859	-	750	684	-	-	-	-	-	-	-	
Approach	SE		NW		NE		SW						
HCM Control Delay, s	0		0		0		0.3						
HCM LOS	A		A		A		A						
Minor Lane/Major Mvmt	NEL	NET	NER	NWL	Ln1 SEL	Ln1	SWL	SWT	SWR				
Capacity (veh/h)	1324	-	-	-	-	-	1566	-	-				
HCM Lane V/C Ratio	-	-	-	-	-	-	0.007	-	-				
HCM Control Delay (s)	0	-	-	0	0	0	7.3	0	-				
HCM Lane LOS	A	-	-	A	A	A	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	-	-	-	0	-	-				

Lanes, Volumes, Timings
15: MA Route 3 SB On Ramp & Derby Street

No Build Improvements
Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↑			↑		
Traffic Volume (vph)	374	323	0	940	0	0
Future Volume (vph)	374	323	0	940	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Frt	0.931					
Flt Protected						
Satd. Flow (prot)	3295	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	3295	0	0	1863	0	0
Link Speed (mph)	30			40	30	
Link Distance (ft)	374			201	513	
Travel Time (s)	8.5			3.4	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	407	351	0	1022	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	758	0	0	1022	0	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 52.8%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

16: MA Route 3 SB Exit 15 On/Off Ramps & MA Route 3 SB On Ramp

No Build Improvements

Timing Plan: AM PEAK



Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	81	0	0	323	0	586
Future Volume (vph)	81	0	0	323	0	586
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	0	1611
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	302			513	366	
Travel Time (s)	6.9			11.7	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	0	0	351	0	637
Shared Lane Traffic (%)						
Lane Group Flow (vph)	88	0	0	351	0	637
Sign Control	Free			Yield	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 39.6%

ICU Level of Service A

Analysis Period (min) 15

**Map - Proposed Delivery Station Building
Levels of Service**

**No Build Improvements
Timing Plan: MID PEAK**



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BL Companies

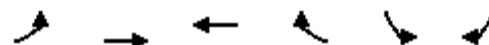
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Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

No Build Improvements

Timing Plan: MID PEAK



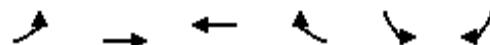
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	51	788	445	424	91	253
Future Volume (vph)	51	788	445	424	91	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165			0	140	0
Storage Lanes	1			1	2	1
Taper Length (ft)	100				250	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.414				0.950	
Satd. Flow (perm)	771	3539	3539	1583	3433	1583
Right Turn on Red				Yes		No
Satd. Flow (RTOR)				461		
Link Speed (mph)		30	40		30	
Link Distance (ft)		274	566		547	
Travel Time (s)		6.2	9.6		12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	857	484	461	99	275
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	857	484	461	99	275
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	4 5
Switch Phase						
Minimum Initial (s)	6.0	10.0	10.0	10.0	6.0	
Minimum Split (s)	13.0	17.0	17.0	17.0	12.0	
Total Split (s)	23.0	78.0	55.0	55.0	12.0	
Total Split (%)	25.6%	86.7%	61.1%	61.1%	13.3%	
Maximum Green (s)	16.0	71.0	48.0	48.0	6.0	
Yellow Time (s)	4.5	5.0	5.0	5.0	3.0	
All-Red Time (s)	2.5	2.0	2.0	2.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	None	None	None	
Act Effect Green (s)	60.9	60.9	47.1	47.1	16.1	29.9
Actuated g/C Ratio	0.68	0.68	0.52	0.52	0.18	0.33
v/c Ratio	0.09	0.36	0.26	0.44	0.16	0.52
Control Delay	5.6	6.3	12.9	2.8	30.8	27.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.6	6.3	12.9	2.8	30.8	27.7
LOS	A	A	B	A	C	C
Approach Delay		6.2	8.0		28.5	
Approach LOS		A	A		C	

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

No Build Improvements

Timing Plan: MID PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	8	108	76	0	24	124
Queue Length 95th (ft)	31	163	118	49	44	187
Internal Link Dist (ft)		194	486		467	
Turn Bay Length (ft)	165				140	
Base Capacity (vph)	699	2791	1927	1072	615	688
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.31	0.25	0.43	0.16	0.40

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 56 (62%), Referenced to phase 2:EBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 10.7

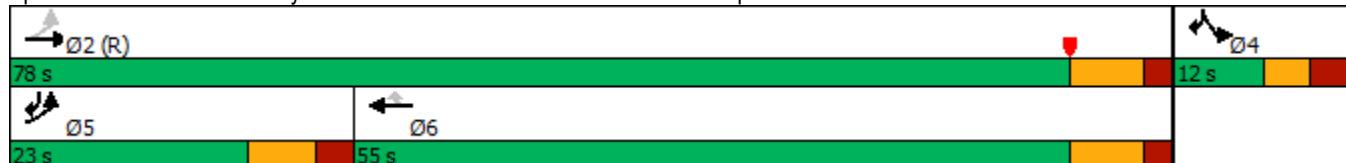
Intersection LOS: B

Intersection Capacity Utilization 42.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

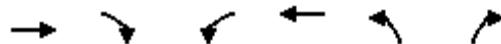


Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

No Build Improvements

Timing Plan: MID PEAK



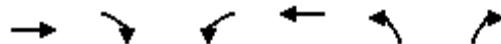
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations	↑↑		↑	↑	↑	↑↑	
Traffic Volume (vph)	405	0	162	536	81	434	
Future Volume (vph)	405	0	162	536	81	434	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	120		0	0	
Storage Lanes		0	1		1	2	
Taper Length (ft)			100		25		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	0.88	
Frt					0.850		
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3539	0	1770	1863	1770	2787	
Flt Permitted			0.392		0.950		
Satd. Flow (perm)	3539	0	730	1863	1770	2787	
Right Turn on Red		Yes			No		
Satd. Flow (RTOR)							
Link Speed (mph)	30		40		30		
Link Distance (ft)	144			854	302		
Travel Time (s)	3.3			14.6	6.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	440	0	176	583	88	472	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	440	0	176	583	88	472	
Turn Type	NA		pm+pt	NA	Prot	pt+ov	
Protected Phases	2		1	16	3	31	6
Permitted Phases			16				
Detector Phase	2		1	16	3	31	
Switch Phase							
Minimum Initial (s)	10.0		6.0		6.0		10.0
Minimum Split (s)	15.5		11.5		12.0		15.5
Total Split (s)	52.0		24.0		14.0		76.0
Total Split (%)	57.8%		26.7%		15.6%		84%
Maximum Green (s)	46.5		18.5		8.0		70.5
Yellow Time (s)	4.5		4.5		3.5		4.5
All-Red Time (s)	1.0		1.0		2.5		1.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	5.5		5.5		6.0		
Lead/Lag	Lag		Lead				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	C-Min		None		None		C-Min
Act Effect Green (s)	33.8		63.0	63.0	15.5	44.7	
Actuated g/C Ratio	0.38		0.70	0.70	0.17	0.50	
v/c Ratio	0.33		0.22	0.45	0.29	0.34	
Control Delay	22.3		5.3	6.8	34.7	13.5	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	22.3		5.3	6.8	34.7	13.5	
LOS	C		A	A	C	B	
Approach Delay	22.3			6.4	16.8		
Approach LOS	C			A	B		

Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

No Build Improvements

Timing Plan: MID PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Queue Length 50th (ft)	105		18	70	44	88	
Queue Length 95th (ft)	165		59	182	85	88	
Internal Link Dist (ft)	64			774	222		
Turn Bay Length (ft)			120				
Base Capacity (vph)	1828		796	1459	304	1414	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.24		0.22	0.40	0.29	0.33	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 46 (51%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 13.7

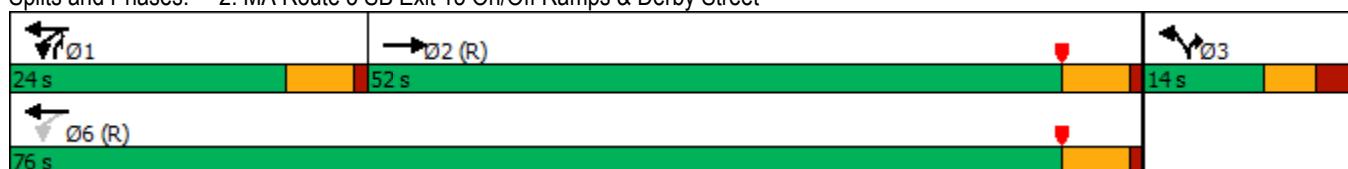
Intersection LOS: B

Intersection Capacity Utilization 42.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street



Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

No Build Improvements

Timing Plan: MID PEAK

	→	→	→	←	←	↑	↑	↓	↓	←	→	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	466	101	182	384	51	111	0	172	40	0	20
Future Volume (vph)	10	466	101	182	384	51	111	0	172	40	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	270		0	0	0	0	0	0	0	0
Storage Lanes	0	0	1		0	0	1	0	1	0	0	1
Taper Length (ft)	25		80			25			25			
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.974			0.983				0.850			0.850
Flt Protected		0.999		0.950			0.950			0.950		
Satd. Flow (prot)	0	3444	0	1770	1831	0	0	1770	1583	0	1770	1583
Flt Permitted		0.946		0.346			0.729			0.679		
Satd. Flow (perm)	0	3261	0	645	1831	0	0	1358	1583	0	1265	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		38			14				187			109
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		530			374			328			180	
Travel Time (s)		9.0			6.4			8.9			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	507	110	198	417	55	121	0	187	43	0	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	628	0	198	472	0	0	121	187	0	43	22
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA	Prot
Protected Phases		2			1	6			8	18		4
Permitted Phases		2			6			8			4	
Detector Phase	2	2		1	6		8	8	18	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	16.0	16.0		12.0	16.0		12.0	12.0		12.0	12.0	12.0
Total Split (s)	49.0	49.0		14.0	63.0		27.0	27.0		27.0	27.0	27.0
Total Split (%)	54.4%	54.4%		15.6%	70.0%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	43.0	43.0		8.0	57.0		21.0	21.0		21.0	21.0	21.0
Yellow Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0			0.0			0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0		6.0			6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None
Act Effect Green (s)	49.6		64.6	64.6			13.4	28.4		13.4	13.4	
Actuated g/C Ratio	0.55	0.72	0.72			0.15	0.32		0.15	0.15		
v/c Ratio	0.35	0.34	0.36			0.60	0.30		0.23	0.07		
Control Delay	12.3		6.1	5.3			47.1	4.1		34.5	0.4	
Queue Delay		0.0	0.0	0.0			0.0	0.0		0.0	0.0	
Total Delay	12.3		6.1	5.3			47.1	4.1		34.5	0.4	
LOS	B		A	A			D	A		C	A	
Approach Delay	12.3			5.5			21.0			23.0		
Approach LOS	B			A			C			C		

Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

No Build Improvements

Timing Plan: MID PEAK



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	89		22	50			65	0		22		0
Queue Length 95th (ft)	162		58	114			112	37		48		0
Internal Link Dist (ft)	450			294			248			100		
Turn Bay Length (ft)				270								
Base Capacity (vph)	1836		579	1317			316	616		295	452	
Starvation Cap Reductn	0		0	0			0	0		0	0	
Spillback Cap Reductn	0		0	0			0	0		0	0	
Storage Cap Reductn	0		0	0			0	0		0	0	
Reduced v/c Ratio	0.34		0.34	0.36			0.38	0.30		0.15	0.05	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 11.6

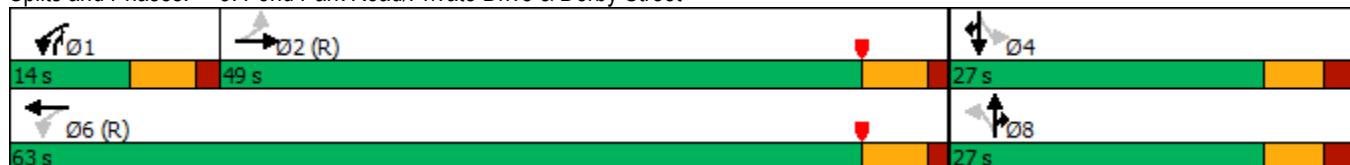
Intersection LOS: B

Intersection Capacity Utilization 67.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Pond Park Road/Private Drive & Derby Street



Lanes, Volumes, Timings
4: Industrial Park Road & Site Drive North

No Build Improvements
Timing Plan: MID PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Volume (vph)	10	131	0	0	141	0
Future Volume (vph)	10	131	0	0	141	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t	0.875					
Flt Protected					0.950	
Satd. Flow (prot)	1630	0	0	1863	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	1630	0	0	1863	1770	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1962			409	430	
Travel Time (s)	44.6			9.3	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	142	0	0	153	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	153	0	0	0	153	0
Sign Control	Free			Stop	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 23.1%

ICU Level of Service A

Analysis Period (min) 15

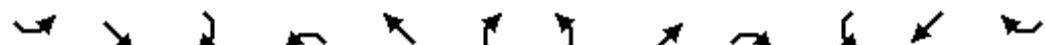
Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↔	↔	
Traffic Vol, veh/h	10	131	0	0	141	0
Future Vol, veh/h	10	131	0	0	141	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	142	0	0	153	0
Major/Minor	Major1	Minor2				
Conflicting Flow All	0	0	82	153		
Stage 1	-	-	0	0		
Stage 2	-	-	82	153		
Critical Hdwy	-	-	6.42	6.52		
Critical Hdwy Stg 1	-	-	-	-		
Critical Hdwy Stg 2	-	-	5.42	5.52		
Follow-up Hdwy	-	-	3.518	4.018		
Pot Cap-1 Maneuver	-	-	920	739		
Stage 1	-	-	-	-		
Stage 2	-	-	941	771		
Platoon blocked, %	-	-				
Mov Cap-1 Maneuver	-	-	920	0		
Mov Cap-2 Maneuver	-	-	920	0		
Stage 1	-	-	-	0		
Stage 2	-	-	941	0		
Approach	EB	WB				
HCM Control Delay, s	0	0				
HCM LOS		A				
Minor Lane/Major Mvmt	EBT	EBRWBLn1				
Capacity (veh/h)	-	-	-			
HCM Lane V/C Ratio	-	-	-			
HCM Control Delay (s)	-	-	0			
HCM Lane LOS	-	-	A			
HCM 95th %tile Q(veh)	-	-	-			

Lanes, Volumes, Timings

5: Industrial Park Road & Site Drive South/Private Drive

No Build Improvements

Timing Plan: MID PEAK



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	0	0	0	0	20	0	111	10	10	111	10
Future Volume (vph)	10	0	0	0	0	20	0	111	10	10	111	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865			0.989			0.990	
Flt Protected		0.950									0.996	
Satd. Flow (prot)	0	1770	0	0	1611	0	0	1842	0	0	1837	0
Flt Permitted		0.950									0.996	
Satd. Flow (perm)	0	1770	0	0	1611	0	0	1842	0	0	1837	0
Link Speed (mph)		30			30			25			30	
Link Distance (ft)		219			497			303			430	
Travel Time (s)		5.0			11.3			8.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	0	0	0	22	0	121	11	11	121	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	22	0	0	132	0	0	143	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 28.7%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
5: Industrial Park Road & Site Drive South/Private Drive

No Build Improvements
Timing Plan: MID PEAK

Intersection												
Int Delay, s/veh 1.3												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	+	+	+	+	+	+	+	+	+	+	+	+
Traffic Vol, veh/h	10	0	0	0	0	20	0	111	10	10	111	10
Future Vol, veh/h	10	0	0	0	0	20	0	111	10	10	111	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	0	0	0	0	22	0	121	11	11	121	11
Major/Minor												
Minor2		Minor1			Major1			Major2				
Conflicting Flow All	287	281	127	276	281	127	132	0	0	132	0	0
Stage 1	149	149	-	127	127	-	-	-	-	-	-	-
Stage 2	138	132	-	149	154	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	665	627	923	676	627	923	1453	-	-	1453	-	-
Stage 1	854	774	-	877	791	-	-	-	-	-	-	-
Stage 2	865	787	-	854	770	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	645	622	923	672	622	923	1453	-	-	1453	-	-
Mov Cap-2 Maneuver	645	622	-	672	622	-	-	-	-	-	-	-
Stage 1	854	768	-	877	791	-	-	-	-	-	-	-
Stage 2	845	787	-	847	764	-	-	-	-	-	-	-
Approach												
SE			NW			NE			SW			
HCM Control Delay, s	10.7		9			0			0.6			
HCM LOS	B		A									
Minor Lane/Major Mvmt		NEL	NET	NER	NWL	NLn1	SELn1	SWL	SWT	SWR		
Capacity (veh/h)	1453		-	-	923	645	1453	-	-			
HCM Lane V/C Ratio	-		-	-	0.024	0.017	0.007	-	-			
HCM Control Delay (s)	0		-	-	9	10.7	7.5	0	-			
HCM Lane LOS	A		-	-	A	B	A	A	-			
HCM 95th %tile Q(veh)	0		-	-	0.1	0.1	0	-	-			

Lanes, Volumes, Timings
15: MA Route 3 SB On Ramp & Derby Street

No Build Improvements
Timing Plan: MID PEAK



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↑			↑		
Traffic Volume (vph)	405	273	0	617	0	0
Future Volume (vph)	405	273	0	617	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Fr _t	0.940					
Flt Protected						
Satd. Flow (prot)	3327	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	3327	0	0	1863	0	0
Link Speed (mph)	30			40	30	
Link Distance (ft)	374			201	513	
Travel Time (s)	8.5			3.4	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	440	297	0	671	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	737	0	0	671	0	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 35.8%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

16: MA Route 3 SB Exit 15 On/Off Ramps & MA Route 3 SB On Ramp

No Build Improvements

Timing Plan: MID PEAK



Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	162	0	0	273	0	515
Future Volume (vph)	162	0	0	273	0	515
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	0	1611
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	302			513	366	
Travel Time (s)	6.9			11.7	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	0	0	297	0	560
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	0	297	0	560
Sign Control	Free			Yield	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 35.2%

ICU Level of Service A

Analysis Period (min) 15

**Map - Proposed Delivery Station Building
Levels of Service**

**No Build Improvements
Timing Plan: PM PEAK**



BL Companies

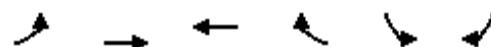
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Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

No Build Improvements

Timing Plan: PM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	152	909	717	556	111	212
Future Volume (vph)	152	909	717	556	111	212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165			0	140	0
Storage Lanes	1			1	2	1
Taper Length (ft)	100				250	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.276				0.950	
Satd. Flow (perm)	514	3539	3539	1583	3433	1583
Right Turn on Red				Yes		No
Satd. Flow (RTOR)				604		
Link Speed (mph)		30	40		30	
Link Distance (ft)		274	566		547	
Travel Time (s)		6.2	9.6		12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	165	988	779	604	121	230
Shared Lane Traffic (%)						
Lane Group Flow (vph)	165	988	779	604	121	230
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	4 5
Switch Phase						
Minimum Initial (s)	6.0	10.0	10.0	10.0	6.0	
Minimum Split (s)	13.0	17.0	17.0	17.0	12.0	
Total Split (s)	23.0	78.0	55.0	55.0	12.0	
Total Split (%)	25.6%	86.7%	61.1%	61.1%	13.3%	
Maximum Green (s)	16.0	71.0	48.0	48.0	6.0	
Yellow Time (s)	4.5	5.0	5.0	5.0	3.0	
All-Red Time (s)	2.5	2.0	2.0	2.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	None	None	None	
Act Effect Green (s)	63.5	63.5	48.0	48.0	13.5	29.0
Actuated g/C Ratio	0.71	0.71	0.53	0.53	0.15	0.32
v/c Ratio	0.34	0.40	0.41	0.54	0.24	0.45
Control Delay	6.8	5.6	13.9	3.1	34.6	26.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.8	5.6	13.9	3.1	34.6	26.8
LOS	A	A	B	A	C	C
Approach Delay		5.7	9.2		29.5	
Approach LOS		A	A		C	

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

No Build Improvements

Timing Plan: PM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	32	121	135	0	30	101
Queue Length 95th (ft)	47	132	182	50	57	165
Internal Link Dist (ft)		194	486		467	
Turn Bay Length (ft)	165				140	
Base Capacity (vph)	586	2791	1944	1142	514	641
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.35	0.40	0.53	0.24	0.36

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 56 (62%), Referenced to phase 2:EBTL, Start of Yellow

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 10.3

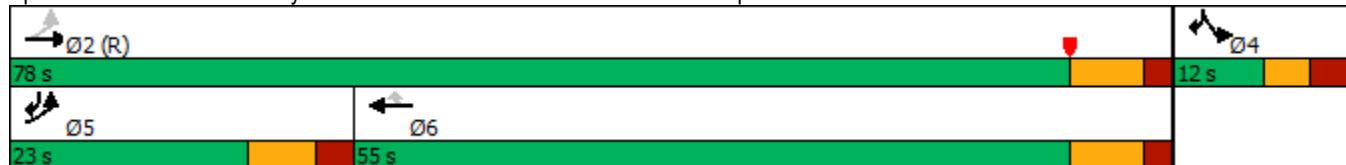
Intersection LOS: B

Intersection Capacity Utilization 54.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

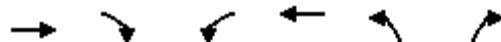


Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

No Build Improvements

Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations	↑↑		↑	↑	↑	↑↑	
Traffic Volume (vph)	617	0	394	535	81	444	
Future Volume (vph)	617	0	394	535	81	444	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	120		0	0	
Storage Lanes		0	1		1	2	
Taper Length (ft)			100		25		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	0.88	
Frt					0.850		
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3539	0	1770	1863	1770	2787	
Flt Permitted			0.261		0.950		
Satd. Flow (perm)	3539	0	486	1863	1770	2787	
Right Turn on Red		Yes			No		
Satd. Flow (RTOR)							
Link Speed (mph)	30		40		30		
Link Distance (ft)	144		854		302		
Travel Time (s)	3.3		14.6		6.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	671	0	428	582	88	483	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	671	0	428	582	88	483	
Turn Type	NA		pm+pt	NA	Prot	pt+ov	
Protected Phases	2		1	16	3	31	6
Permitted Phases			16				
Detector Phase	2		1	16	3	31	
Switch Phase							
Minimum Initial (s)	10.0		6.0		6.0		10.0
Minimum Split (s)	15.5		11.5		12.0		15.5
Total Split (s)	52.0		24.0		14.0		76.0
Total Split (%)	57.8%		26.7%		15.6%		84%
Maximum Green (s)	46.5		18.5		8.0		70.5
Yellow Time (s)	4.5		4.5		3.5		4.5
All-Red Time (s)	1.0		1.0		2.5		1.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	5.5		5.5		6.0		
Lead/Lag	Lag		Lead				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	C-Min		None		None		C-Min
Act Effect Green (s)	34.3		62.9	62.9	15.6	44.2	
Actuated g/C Ratio	0.38		0.70	0.70	0.17	0.49	
v/c Ratio	0.50		0.64	0.45	0.29	0.35	
Control Delay	20.7		22.6	10.3	34.1	14.3	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	20.7		22.6	10.3	34.1	14.3	
LOS	C		C	B	C	B	
Approach Delay	20.7		15.5		17.3		
Approach LOS	C		B	B			

Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

No Build Improvements

Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Queue Length 50th (ft)	162		161	90	44	84	
Queue Length 95th (ft)	234		258	256	82	121	
Internal Link Dist (ft)	64			774	222		
Turn Bay Length (ft)			120				
Base Capacity (vph)	1828		679	1459	307	1392	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.37		0.63	0.40	0.29	0.35	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 46 (51%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 17.5

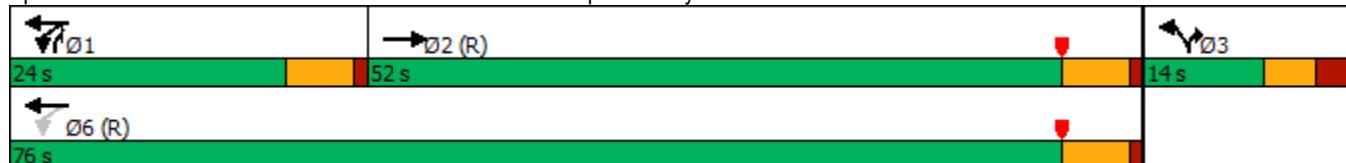
Intersection LOS: B

Intersection Capacity Utilization 58.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street



Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

No Build Improvements

Timing Plan: PM PEAK

	→	→	←	←	→	←	↑	↑	↓	↓	↑	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	768	40	71	525	20	172	0	303	61	0	20
Future Volume (vph)	0	768	40	71	525	20	172	0	303	61	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	270		0	0		0	0		0
Storage Lanes	0		0	1		0	0		1	0		1
Taper Length (ft)	25			80			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.994				0.850			0.850
Flt Protected				0.950				0.950			0.950	
Satd. Flow (prot)	0	3514	0	1770	1852	0	0	1770	1583	0	1770	1583
Flt Permitted				0.230				0.714			0.561	
Satd. Flow (perm)	0	3514	0	428	1852	0	0	1330	1583	0	1045	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			4				108			109
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		530			374			328			180	
Travel Time (s)		9.0			6.4			8.9			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	835	43	77	571	22	187	0	329	66	0	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	878	0	77	593	0	0	187	329	0	66	22
Turn Type		NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA	Prot
Protected Phases		2			1	6			8	18		4
Permitted Phases		2			6			8			4	
Detector Phase	2	2		1	6		8	8	18	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	16.0	16.0		12.0	16.0		12.0	12.0		12.0	12.0	12.0
Total Split (s)	49.0	49.0		14.0	63.0		27.0	27.0		27.0	27.0	27.0
Total Split (%)	54.4%	54.4%		15.6%	70.0%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	43.0	43.0		8.0	57.0		21.0	21.0		21.0	21.0	21.0
Yellow Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0			0.0			0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0		6.0			6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None
Act Effect Green (s)	46.3		59.4	59.4			18.6	31.7		18.6	18.6	
Actuated g/C Ratio	0.51		0.66	0.66			0.21	0.35		0.21	0.21	
v/c Ratio	0.48		0.20	0.48			0.68	0.52		0.31	0.05	
Control Delay	16.6		6.8	7.5			44.6	17.0		31.6	0.2	
Queue Delay		0.0	0.0	0.0			0.0	0.0		0.0	0.0	
Total Delay	16.6		6.8	7.5			44.6	17.0		31.6	0.2	
LOS	B		A	A			D	B		C	A	
Approach Delay	16.6			7.4			27.0			23.8		
Approach LOS	B			A			C			C		

Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

No Build Improvements

Timing Plan: PM PEAK



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	158			6	40			99	96		32	0
Queue Length 95th (ft)	265			31	137			151	142		62	0
Internal Link Dist (ft)	450				294			248			100	
Turn Bay Length (ft)				270								
Base Capacity (vph)	1871			404	1252			331	633		259	475
Starvation Cap Reductn	0			0	0			0	0		0	0
Spillback Cap Reductn	0			0	0			0	0		0	0
Storage Cap Reductn	0			0	0			0	0		0	0
Reduced v/c Ratio	0.47			0.19	0.47			0.56	0.52		0.25	0.05

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 16.5

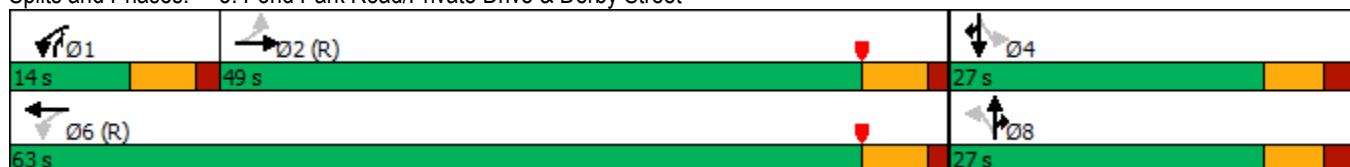
Intersection LOS: B

Intersection Capacity Utilization 82.5%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Pond Park Road/Private Drive & Derby Street



Lanes, Volumes, Timings
4: Industrial Park Road & Site Drive North

No Build Improvements
Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Volume (vph)	0	30	0	0	192	0
Future Volume (vph)	0	30	0	0	192	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t	0.865					
Flt Protected					0.950	
Satd. Flow (prot)	1611	0	0	1863	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	1611	0	0	1863	1770	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1962			409	430	
Travel Time (s)	44.6			9.3	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	33	0	0	209	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	33	0	0	0	209	0
Sign Control	Free			Stop	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 20.6%

ICU Level of Service A

Analysis Period (min) 15

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↔	↔	
Traffic Vol, veh/h	0	30	0	0	192	0
Future Vol, veh/h	0	30	0	0	192	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	0	0	209	0
Major/Minor	Major1	Minor2				
Conflicting Flow All	0	0	17	33		
Stage 1	-	-	0	0		
Stage 2	-	-	17	33		
Critical Hdwy	-	-	6.42	6.52		
Critical Hdwy Stg 1	-	-	-	-		
Critical Hdwy Stg 2	-	-	5.42	5.52		
Follow-up Hdwy	-	-	3.518	4.018		
Pot Cap-1 Maneuver	-	-	1001	860		
Stage 1	-	-	-	-		
Stage 2	-	-	1006	868		
Platoon blocked, %	-	-				
Mov Cap-1 Maneuver	-	-	1001	0		
Mov Cap-2 Maneuver	-	-	1001	0		
Stage 1	-	-	-	0		
Stage 2	-	-	1006	0		
Approach	EB	WB				
HCM Control Delay, s	0	0				
HCM LOS		A				
Minor Lane/Major Mvmt	EBT	EBRWBLn1				
Capacity (veh/h)	-	-	-			
HCM Lane V/C Ratio	-	-	-			
HCM Control Delay (s)	-	-	0			
HCM Lane LOS	-	-	A			
HCM 95th %tile Q(veh)	-	-	-			

Lanes, Volumes, Timings

5: Industrial Park Road & Site Drive South/Private Drive

No Build Improvements

Timing Plan: PM PEAK



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	0	0	0	0	10	0	172	0	0	30	0
Future Volume (vph)	10	0	0	0	0	10	0	172	0	0	30	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.865						
Flt Protected				0.950								
Satd. Flow (prot)	0	1770	0	0	1611	0	0	1863	0	0	1863	0
Flt Permitted				0.950								
Satd. Flow (perm)	0	1770	0	0	1611	0	0	1863	0	0	1863	0
Link Speed (mph)				30		30		25			30	
Link Distance (ft)				219		497		303			430	
Travel Time (s)				5.0		11.3		8.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	0	0	0	11	0	187	0	0	33	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	11	0	0	187	0	0	33	0
Sign Control				Stop		Stop		Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 22.9%

ICU Level of Service A

Analysis Period (min) 15

Intersection												
Int Delay, s/veh 0.9												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	+	+	+	+	+	+	+	+	+	+	+	+
Traffic Vol, veh/h	10	0	0	0	0	10	0	172	0	0	30	0
Future Vol, veh/h	10	0	0	0	0	10	0	172	0	0	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	0	0	0	0	11	0	187	0	0	33	0
Major/Minor												
Minor2		Minor1			Major1			Major2				
Conflicting Flow All	226	220	33	220	220	187	33	0	0	187	0	0
Stage 1	33	33	-	187	187	-	-	-	-	-	-	-
Stage 2	193	187	-	33	33	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	729	678	1041	736	678	855	1579	-	-	1387	-	-
Stage 1	983	868	-	815	745	-	-	-	-	-	-	-
Stage 2	809	745	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	720	678	1041	736	678	855	1579	-	-	1387	-	-
Mov Cap-2 Maneuver	720	678	-	736	678	-	-	-	-	-	-	-
Stage 1	983	868	-	815	745	-	-	-	-	-	-	-
Stage 2	799	745	-	983	868	-	-	-	-	-	-	-
Approach												
SE			NW			NE			SW			
HCM Control Delay, s	10.1			9.3			0			0		
HCM LOS	B			A								
Minor Lane/Major Mvmt												
Capacity (veh/h)	1579	-	-	855	720	1387	-	-				
HCM Lane V/C Ratio	-	-	-	0.013	0.015	-	-	-				
HCM Control Delay (s)	0	-	-	9.3	10.1	0	-	-				
HCM Lane LOS	A	-	-	A	B	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-				

Lanes, Volumes, Timings
15: MA Route 3 SB On Ramp & Derby Street

No Build Improvements
Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↓			↑		
Traffic Volume (vph)	617	515	0	616	0	0
Future Volume (vph)	617	515	0	616	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Fr _t	0.932					
Flt Protected						
Satd. Flow (prot)	3299	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	3299	0	0	1863	0	0
Link Speed (mph)	30			40	30	
Link Distance (ft)	374			201	513	
Travel Time (s)	8.5			3.4	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	671	560	0	670	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1231	0	0	670	0	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 36.9%

ICU Level of Service A

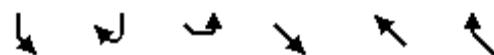
Analysis Period (min) 15

Lanes, Volumes, Timings

16: MA Route 3 SB Exit 15 On/Off Ramps & MA Route 3 SB On Ramp

No Build Improvements

Timing Plan: PM PEAK



Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	394	0	0	515	0	525
Future Volume (vph)	394	0	0	515	0	525
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	0	1611
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	302			513	366	
Travel Time (s)	6.9			11.7	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	428	0	0	560	0	571
Shared Lane Traffic (%)						
Lane Group Flow (vph)	428	0	0	560	0	571
Sign Control	Free			Yield	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 55.6%

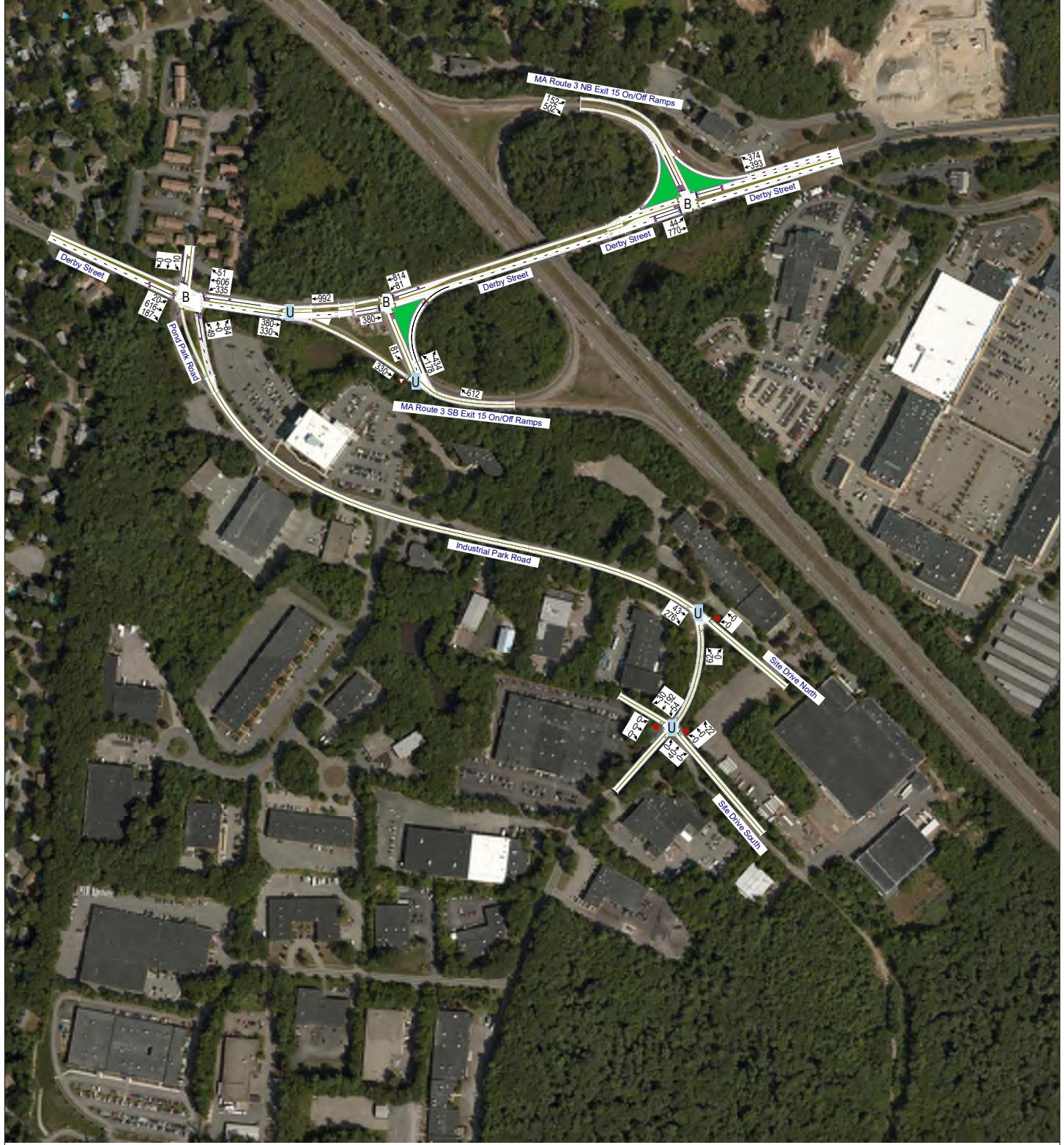
ICU Level of Service B

Analysis Period (min) 15

BUILD

**Map - Proposed Delivery Station Building
Levels of Service**

**Build Improvements
Timing Plan: AM PEAK**



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BL Companies

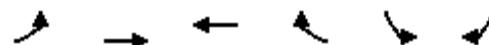
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Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

Build Improvements

Timing Plan: AM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	44	770	393	374	152	502
Future Volume (vph)	44	770	393	374	152	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165			0	140	0
Storage Lanes	1			1	2	1
Taper Length (ft)	100				250	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.409				0.950	
Satd. Flow (perm)	762	3539	3539	1583	3433	1583
Right Turn on Red				Yes		No
Satd. Flow (RTOR)				407		
Link Speed (mph)		30	40		30	
Link Distance (ft)		274	566		547	
Travel Time (s)		6.2	9.6		12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	48	837	427	407	165	546
Shared Lane Traffic (%)						
Lane Group Flow (vph)	48	837	427	407	165	546
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	4 5
Switch Phase						
Minimum Initial (s)	6.0	10.0	10.0	10.0	6.0	
Minimum Split (s)	13.0	17.0	17.0	17.0	12.0	
Total Split (s)	31.0	78.0	47.0	47.0	12.0	
Total Split (%)	34.4%	86.7%	52.2%	52.2%	13.3%	
Maximum Green (s)	24.0	71.0	40.0	40.0	6.0	
Yellow Time (s)	4.5	5.0	5.0	5.0	3.0	
All-Red Time (s)	2.5	2.0	2.0	2.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	None	None	None	
Act Effect Green (s)	54.8	54.8	34.9	34.9	22.2	42.1
Actuated g/C Ratio	0.61	0.61	0.39	0.39	0.25	0.47
v/c Ratio	0.08	0.39	0.31	0.47	0.20	0.74
Control Delay	5.9	6.8	21.4	4.7	27.2	25.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	6.8	21.4	4.7	27.2	25.5
LOS	A	A	C	A	C	C
Approach Delay		6.7	13.2		25.9	
Approach LOS		A	B		C	

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

Build Improvements

Timing Plan: AM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	6	59	87	0	36	242
Queue Length 95th (ft)	30	171	149	68	65	286
Internal Link Dist (ft)		194	486		467	
Turn Bay Length (ft)	165				140	
Base Capacity (vph)	732	2791	1586	934	846	935
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.30	0.27	0.44	0.20	0.58

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 78 (87%), Referenced to phase 2:EBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 14.6

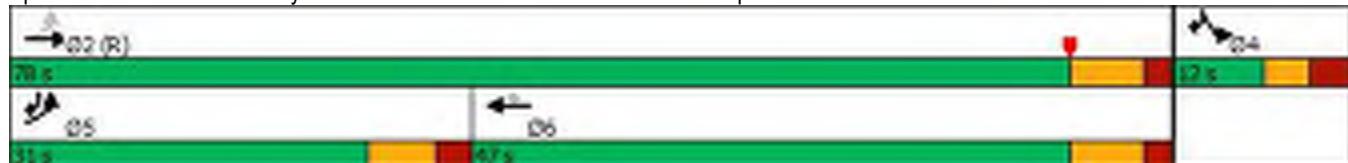
Intersection LOS: B

Intersection Capacity Utilization 52.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

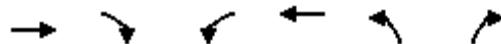


Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

Build Improvements

Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations	↑↑		↑	↑	↑	↑↑	
Traffic Volume (vph)	380	0	81	814	178	434	
Future Volume (vph)	380	0	81	814	178	434	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	120		0	0	
Storage Lanes		0	1		1	2	
Taper Length (ft)			100		25		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	0.88	
Frt					0.850		
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3539	0	1770	1863	1770	2787	
Flt Permitted			0.387		0.950		
Satd. Flow (perm)	3539	0	721	1863	1770	2787	
Right Turn on Red		Yes			No		
Satd. Flow (RTOR)							
Link Speed (mph)	30		40		30		
Link Distance (ft)	144			854	302		
Travel Time (s)	3.3			14.6	6.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	413	0	88	885	193	472	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	413	0	88	885	193	472	
Turn Type	NA		pm+pt	NA	Prot	pt+ov	
Protected Phases	2		1	16	3	31	6
Permitted Phases			16				
Detector Phase	2		1	16	3	31	
Switch Phase							
Minimum Initial (s)	10.0		6.0		6.0		10.0
Minimum Split (s)	15.5		11.5		12.0		15.5
Total Split (s)	53.0		17.0		20.0		70.0
Total Split (%)	58.9%		18.9%		22.2%		78%
Maximum Green (s)	47.5		11.5		14.0		64.5
Yellow Time (s)	4.5		4.5		3.5		4.5
All-Red Time (s)	1.0		1.0		2.5		1.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	5.5		5.5		6.0		
Lead/Lag	Lag		Lead				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	C-Min		None		None		C-Min
Act Effect Green (s)	29.2		62.2	62.2	16.3	49.3	
Actuated g/C Ratio	0.32		0.69	0.69	0.18	0.55	
v/c Ratio	0.36		0.11	0.69	0.61	0.31	
Control Delay	17.1		5.1	12.4	41.6	12.3	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	17.1		5.1	12.4	41.6	12.3	
LOS	B		A	B	D	B	
Approach Delay	17.1			11.8	20.8		
Approach LOS	B			B	C		

Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

Build Improvements

Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Queue Length 50th (ft)	113		7	267	103	57	
Queue Length 95th (ft)	58		m44	510	160	146	
Internal Link Dist (ft)	64			774	222		
Turn Bay Length (ft)				120			
Base Capacity (vph)	1867		819	1341	325	1462	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.22		0.11	0.66	0.59	0.32	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 50 (56%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 15.8

Intersection LOS: B

Intersection Capacity Utilization 62.3%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street



Lanes, Volumes, Timings

Build Improvements

3: Pond Park Road/Private Drive & Derby Street

Timing Plan: AM PEAK

	→	→	→	←	←	↑	↑	↓	↓	←	→	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	616	187	335	606	51	49	0	84	10	0	0
Future Volume (vph)	20	616	187	335	606	51	49	0	84	10	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	270		0	0	0	0	0	0	0	0
Storage Lanes	0	0	1		0	0	0	1	0	0	0	1
Taper Length (ft)	25		80			25			25			
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966			0.988				0.850			
Flt Protected		0.999		0.950			0.950			0.950		
Satd. Flow (prot)	0	3415	0	1770	1840	0	0	1770	1583	0	1770	1863
Flt Permitted		0.928		0.238			0.750			0.722		
Satd. Flow (perm)	0	3173	0	443	1840	0	0	1397	1583	0	1345	1863
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		57			14				91			
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		530			374			328			180	
Travel Time (s)		9.0			6.4			8.9			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	670	203	364	659	55	53	0	91	11	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	895	0	364	714	0	0	53	91	0	11	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA	Prot
Protected Phases		2			1	6			8	18		4
Permitted Phases		2			6			8			4	
Detector Phase	2	2		1	6		8	8	18	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	16.0	16.0		12.0	16.0		12.0	12.0		12.0	12.0	12.0
Total Split (s)	48.0	48.0		26.0	74.0		16.0	16.0		16.0	16.0	16.0
Total Split (%)	53.3%	53.3%		28.9%	82.2%		17.8%	17.8%		17.8%	17.8%	17.8%
Maximum Green (s)	42.0	42.0		20.0	68.0		10.0	10.0		10.0	10.0	10.0
Yellow Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0			0.0			0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0		6.0			6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None
Act Effect Green (s)	51.1		71.5	72.7			8.9	26.9			8.9	
Actuated g/C Ratio	0.57		0.79	0.81			0.10	0.30			0.10	
v/c Ratio	0.49		0.65	0.48			0.38	0.17			0.08	
Control Delay	14.1		11.8	5.4			45.1	4.5			36.5	
Queue Delay		0.0	0.0	0.0			0.0	0.0			0.0	
Total Delay	14.1		11.8	5.4			45.1	4.5			36.5	
LOS	B		B	A			D	A			D	
Approach Delay	14.1			7.5			19.5				36.5	
Approach LOS	B			A			B				D	

Lanes, Volumes, Timings

Build Improvements

3: Pond Park Road/Private Drive & Derby Street

Timing Plan: AM PEAK



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		149		42	107			29	0		6	
Queue Length 95th (ft)		256		189	316			63	26		21	
Internal Link Dist (ft)		450			294			248			100	
Turn Bay Length (ft)				270								
Base Capacity (vph)		1849		649	1498			163	606		157	
Starvation Cap Reductn		0		0	0			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.48		0.56	0.48			0.33	0.15		0.07	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 18 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 11.3

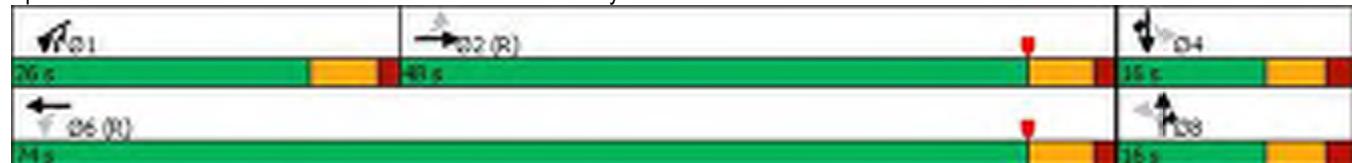
Intersection LOS: B

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Pond Park Road/Private Drive & Derby Street



Lanes, Volumes, Timings
4: Industrial Park Road & Site Drive North

Build Improvements
Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↓	↖	↙	↖	↗
Traffic Volume (vph)	43	276	0	0	62	0
Future Volume (vph)	43	276	0	0	62	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t	0.883					
Flt Protected					0.950	
Satd. Flow (prot)	1645	0	0	1863	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	1645	0	0	1863	1770	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1962			409	430	
Travel Time (s)	44.6			9.3	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	300	0	0	67	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	347	0	0	0	67	0
Sign Control	Free			Stop	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 29.4%

ICU Level of Service A

Analysis Period (min) 15

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↔	↔	
Traffic Vol, veh/h	43	276	0	0	62	0
Future Vol, veh/h	43	276	0	0	62	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	47	300	0	0	67	0
Major/Minor	Major1	Minor2				
Conflicting Flow All	0	0	197	347		
Stage 1	-	-	0	0		
Stage 2	-	-	197	347		
Critical Hdwy	-	-	6.42	6.52		
Critical Hdwy Stg 1	-	-	-	-		
Critical Hdwy Stg 2	-	-	5.42	5.52		
Follow-up Hdwy	-	-	3.518	4.018		
Pot Cap-1 Maneuver	-	-	792	576		
Stage 1	-	-	-	-		
Stage 2	-	-	836	635		
Platoon blocked, %	-	-				
Mov Cap-1 Maneuver	-	-	792	0		
Mov Cap-2 Maneuver	-	-	792	0		
Stage 1	-	-	-	0		
Stage 2	-	-	836	0		
Approach	EB	WB				
HCM Control Delay, s	0	0				
HCM LOS		A				
Minor Lane/Major Mvmt	EBT	EBRWBLn1				
Capacity (veh/h)	-	-	-			
HCM Lane V/C Ratio	-	-	-			
HCM Control Delay (s)	-	-	0			
HCM Lane LOS	-	-	A			
HCM 95th %tile Q(veh)	-	-	-			

Lanes, Volumes, Timings

Build Improvements

5: Industrial Park Road & Site Drive South/Private Drive

Timing Plan: AM PEAK

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	22	0	40	0	54	192	30
Future Volume (vph)	0	0	0	0	0	22	0	40	0	54	192	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.865					0.985	
Flt Protected											0.990	
Satd. Flow (prot)	0	1863	0	0	1611	0	0	1863	0	0	1816	0
Flt Permitted											0.990	
Satd. Flow (perm)	0	1863	0	0	1611	0	0	1863	0	0	1816	0
Link Speed (mph)		30				30					25	30
Link Distance (ft)		219				497					303	430
Travel Time (s)		5.0				11.3					8.3	9.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	24	0	43	0	59	209	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	24	0	0	43	0	0	301	0
Sign Control		Stop				Stop			Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 31.6%

ICU Level of Service A

Analysis Period (min) 15

Intersection												
Int Delay, s/veh 1.7												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	+	+	+	+	+	+	+	+	+	+	+	+
Traffic Vol, veh/h	0	0	0	0	0	22	0	40	0	54	192	30
Future Vol, veh/h	0	0	0	0	0	22	0	40	0	54	192	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	24	0	43	0	59	209	33
Major/Minor												
Minor2		Minor1			Major1			Major2				
Conflicting Flow All	399	387	226	387	403	43	242	0	0	43	0	0
Stage 1	344	344	-	43	43	-	-	-	-	-	-	-
Stage 2	55	43	-	344	360	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	561	547	813	572	536	1027	1324	-	-	1566	-	-
Stage 1	671	637	-	971	859	-	-	-	-	-	-	-
Stage 2	957	859	-	671	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	530	523	813	553	512	1027	1324	-	-	1566	-	-
Mov Cap-2 Maneuver	530	523	-	553	512	-	-	-	-	-	-	-
Stage 1	671	609	-	971	859	-	-	-	-	-	-	-
Stage 2	935	859	-	641	598	-	-	-	-	-	-	-
Approach												
SE			NW			NE			SW			
HCM Control Delay, s	0			8.6			0		0	1.4		
HCM LOS	A			A			A		A	A		
Minor Lane/Major Mvmt												
Capacity (veh/h)	1324	-	-	1027	-	1566	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	0.023	-	0.037	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	8.6	0	7.4	0	-	-	-	-	-
HCM Lane LOS	A	-	-	A	A	A	A	-	-	-	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-	0.1	-	-	-	-	-	-

Lanes, Volumes, Timings
15: MA Route 3 SB On Ramp & Derby Street

Build Improvements
Timing Plan: AM PEAK



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↑			↑		
Traffic Volume (vph)	380	330	0	992	0	0
Future Volume (vph)	380	330	0	992	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Fr _t	0.930					
Flt Protected						
Satd. Flow (prot)	3291	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	3291	0	0	1863	0	0
Link Speed (mph)	30			40	30	
Link Distance (ft)	374			201	513	
Travel Time (s)	8.5			3.4	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	413	359	0	1078	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	772	0	0	1078	0	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 55.5%

ICU Level of Service B

Analysis Period (min) 15

Lanes, Volumes, Timings

16: MA Route 3 SB Exit 15 On/Off Ramps & MA Route 3 SB On Ramp

Build Improvements

Timing Plan: AM PEAK



Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	81	0	0	330	0	612
Future Volume (vph)	81	0	0	330	0	612
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	0	1611
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	302			513	366	
Travel Time (s)	6.9			11.7	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	0	0	359	0	665
Shared Lane Traffic (%)						
Lane Group Flow (vph)	88	0	0	359	0	665
Sign Control	Free			Yield	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 41.2%

ICU Level of Service A

Analysis Period (min) 15

**Map - Proposed Delivery Station Building
Levels of Service**

**Build Improvements
Timing Plan: MID PEAK**



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BL Companies

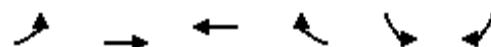
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Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

Build Improvements

Timing Plan: MID PEAK



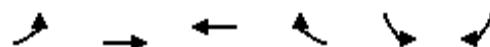
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	63	794	451	424	91	265
Future Volume (vph)	63	794	451	424	91	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165			0	140	0
Storage Lanes	1			1	2	1
Taper Length (ft)	100				250	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.409				0.950	
Satd. Flow (perm)	762	3539	3539	1583	3433	1583
Right Turn on Red				Yes		No
Satd. Flow (RTOR)				461		
Link Speed (mph)		30	40		30	
Link Distance (ft)		274	566		547	
Travel Time (s)		6.2	9.6		12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	68	863	490	461	99	288
Shared Lane Traffic (%)						
Lane Group Flow (vph)	68	863	490	461	99	288
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	4 5
Switch Phase						
Minimum Initial (s)	6.0	10.0	10.0	10.0	6.0	
Minimum Split (s)	13.0	17.0	17.0	17.0	12.0	
Total Split (s)	23.0	78.0	55.0	55.0	12.0	
Total Split (%)	25.6%	86.7%	61.1%	61.1%	13.3%	
Maximum Green (s)	16.0	71.0	48.0	48.0	6.0	
Yellow Time (s)	4.5	5.0	5.0	5.0	3.0	
All-Red Time (s)	2.5	2.0	2.0	2.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	None	None	None	
Act Effect Green (s)	60.4	60.4	46.4	46.4	16.6	30.6
Actuated g/C Ratio	0.67	0.67	0.52	0.52	0.18	0.34
v/c Ratio	0.12	0.36	0.27	0.44	0.16	0.54
Control Delay	5.7	6.3	13.4	2.9	30.3	27.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.7	6.3	13.4	2.9	30.3	27.4
LOS	A	A	B	A	C	C
Approach Delay		6.3	8.3		28.1	
Approach LOS		A	A		C	

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

Build Improvements

Timing Plan: MID PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	10	106	78	0	24	130
Queue Length 95th (ft)	37	167	124	51	43	191
Internal Link Dist (ft)		194	486		467	
Turn Bay Length (ft)	165				140	
Base Capacity (vph)	690	2791	1919	1069	633	696
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.31	0.26	0.43	0.16	0.41

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 56 (62%), Referenced to phase 2:EBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 10.9

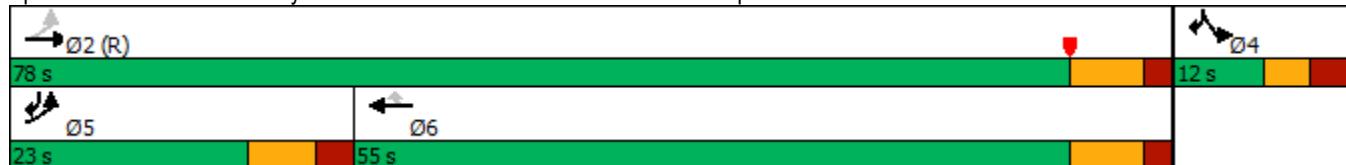
Intersection LOS: B

Intersection Capacity Utilization 42.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

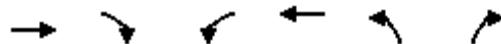


Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

Build Improvements

Timing Plan: MID PEAK



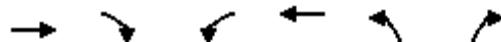
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations	↑↑		↑	↑	↑	↑↑	
Traffic Volume (vph)	423	0	162	554	99	434	
Future Volume (vph)	423	0	162	554	99	434	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	120		0	0	
Storage Lanes		0	1		1	2	
Taper Length (ft)			100		25		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	0.88	
Frt					0.850		
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3539	0	1770	1863	1770	2787	
Flt Permitted			0.378		0.950		
Satd. Flow (perm)	3539	0	704	1863	1770	2787	
Right Turn on Red		Yes			No		
Satd. Flow (RTOR)							
Link Speed (mph)	30		40		30		
Link Distance (ft)	144			854	302		
Travel Time (s)	3.3			14.6	6.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	460	0	176	602	108	472	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	460	0	176	602	108	472	
Turn Type	NA		pm+pt	NA	Prot	pt+ov	
Protected Phases	2		1	16	3	31	6
Permitted Phases			16				
Detector Phase	2		1	16	3	31	
Switch Phase							
Minimum Initial (s)	10.0		6.0		6.0		10.0
Minimum Split (s)	15.5		11.5		12.0		15.5
Total Split (s)	52.0		24.0		14.0		76.0
Total Split (%)	57.8%		26.7%		15.6%		84%
Maximum Green (s)	46.5		18.5		8.0		70.5
Yellow Time (s)	4.5		4.5		3.5		4.5
All-Red Time (s)	1.0		1.0		2.5		1.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	5.5		5.5		6.0		
Lead/Lag	Lag		Lead				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	C-Min		None		None		C-Min
Act Effect Green (s)	33.8		63.2	63.2	15.3	44.7	
Actuated g/C Ratio	0.38		0.70	0.70	0.17	0.50	
v/c Ratio	0.35		0.23	0.46	0.36	0.34	
Control Delay	20.6		5.3	6.9	36.3	13.5	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	20.6		5.3	6.9	36.3	13.5	
LOS	C		A	A	D	B	
Approach Delay	20.6			6.6	17.8		
Approach LOS	C			A	B		

Lanes, Volumes, Timings

2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

Build Improvements

Timing Plan: MID PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Queue Length 50th (ft)	111		17	70	55	86	
Queue Length 95th (ft)	170		60	182	101	93	
Internal Link Dist (ft)	64			774	222		
Turn Bay Length (ft)			120				
Base Capacity (vph)	1828		788	1459	300	1411	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.25		0.22	0.41	0.36	0.33	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 46 (51%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 13.7

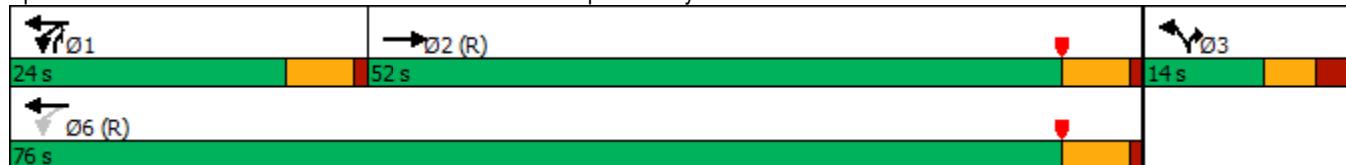
Intersection LOS: B

Intersection Capacity Utilization 44.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street



Lanes, Volumes, Timings

Build Improvements

3: Pond Park Road/Private Drive & Derby Street

Timing Plan: MID PEAK

	→	→	←	←	→	←	↑	↑	↓	↓	↑	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	466	125	218	384	51	135	0	209	40	0	20
Future Volume (vph)	10	466	125	218	384	51	135	0	209	40	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	270		0	0		0	0		0
Storage Lanes	0		0	1		0	0		1	0		1
Taper Length (ft)	25			80			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.969			0.983				0.850			0.850
Flt Protected		0.999		0.950			0.950			0.950		
Satd. Flow (prot)	0	3426	0	1770	1831	0	0	1770	1583	0	1770	1583
Flt Permitted		0.946		0.324			0.729			0.636		
Satd. Flow (perm)	0	3244	0	604	1831	0	0	1358	1583	0	1185	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50			14				227			109
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		530			374			328			180	
Travel Time (s)		9.0			6.4			8.9			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	507	136	237	417	55	147	0	227	43	0	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	654	0	237	472	0	0	147	227	0	43	22
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA	Prot
Protected Phases		2			1	6			8	18		4
Permitted Phases		2			6			8			4	
Detector Phase	2	2		1	6		8	8	18	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	16.0	16.0		12.0	16.0		12.0	12.0		12.0	12.0	12.0
Total Split (s)	49.0	49.0		14.0	63.0		27.0	27.0		27.0	27.0	27.0
Total Split (%)	54.4%	54.4%		15.6%	70.0%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	43.0	43.0		8.0	57.0		21.0	21.0		21.0	21.0	21.0
Yellow Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0			0.0			0.0		0.0
Total Lost Time (s)		6.0		6.0	6.0		6.0			6.0		6.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None
Act Effect Green (s)	46.3		62.6	62.6			15.4	31.7		15.4	15.4	
Actuated g/C Ratio	0.51		0.70	0.70			0.17	0.35		0.17	0.17	
v/c Ratio	0.39		0.43	0.37			0.63	0.32		0.21	0.06	
Control Delay	14.6		8.0	5.8			45.9	3.3		32.1	0.3	
Queue Delay		0.0	0.0	0.0			0.0	0.0		0.0	0.0	
Total Delay	14.6		8.0	5.8			45.9	3.3		32.1	0.3	
LOS	B		A	A			D	A		C	A	
Approach Delay	14.6			6.6			20.1			21.4		
Approach LOS	B			A			C			C		

Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

Build Improvements

Timing Plan: MID PEAK



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	100			26	49			79	0		21	0
Queue Length 95th (ft)	190			73	105			128	36		47	0
Internal Link Dist (ft)	450				294			248			100	
Turn Bay Length (ft)				270								
Base Capacity (vph)	1762			556	1284			321	698		280	458
Starvation Cap Reductn	0			0	0			0	0		0	0
Spillback Cap Reductn	0			0	0			0	0		0	0
Storage Cap Reductn	0			0	0			0	0		0	0
Reduced v/c Ratio	0.37			0.43	0.37			0.46	0.33		0.15	0.05

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 12.8

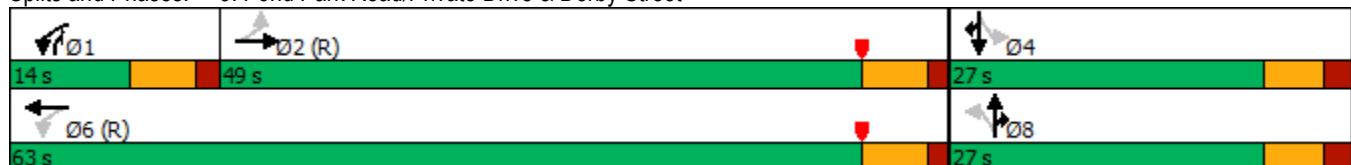
Intersection LOS: B

Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Pond Park Road/Private Drive & Derby Street



Lanes, Volumes, Timings
4: Industrial Park Road & Site Drive North

Build Improvements
Timing Plan: MID PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Volume (vph)	10	191	0	22	180	0
Future Volume (vph)	10	191	0	22	180	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872					
Flt Protected					0.950	
Satd. Flow (prot)	1624	0	0	1863	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	1624	0	0	1863	1770	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1962			409	430	
Travel Time (s)	44.6			9.3	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	208	0	24	196	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	219	0	0	24	196	0
Sign Control	Free			Stop	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 29.0%

ICU Level of Service A

Analysis Period (min) 15

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑		↔	↔		
Traffic Vol, veh/h	10	191	0	22	180	0
Future Vol, veh/h	10	191	0	22	180	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	208	0	24	196	0
Major/Minor	Major1	Minor2				
Conflicting Flow All	0	0	115	219		
Stage 1	-	-	0	0		
Stage 2	-	-	115	219		
Critical Hdwy	-	-	6.42	6.52		
Critical Hdwy Stg 1	-	-	-	-		
Critical Hdwy Stg 2	-	-	5.42	5.52		
Follow-up Hdwy	-	-	3.518	4.018		
Pot Cap-1 Maneuver	-	-	881	679		
Stage 1	-	-	-	-		
Stage 2	-	-	910	722		
Platoon blocked, %	-	-				
Mov Cap-1 Maneuver	-	-	881	0		
Mov Cap-2 Maneuver	-	-	881	0		
Stage 1	-	-	-	0		
Stage 2	-	-	910	0		
Approach	EB	WB				
HCM Control Delay, s	0					
HCM LOS	-					
Minor Lane/Major Mvmt	EBT	EBRWBLn1				
Capacity (veh/h)	-	-	-			
HCM Lane V/C Ratio	-	-	-			
HCM Control Delay (s)	-	-	-			
HCM Lane LOS	-	-	-			
HCM 95th %tile Q(veh)	-	-	-			

Lanes, Volumes, Timings

Build Improvements

5: Industrial Park Road & Site Drive South/Private Drive

Timing Plan: MID PEAK



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	0	0	0	0	59	0	111	10	70	111	10
Future Volume (vph)	10	0	0	0	0	59	0	111	10	70	111	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865			0.989			0.993	
Flt Protected		0.950									0.982	
Satd. Flow (prot)	0	1770	0	0	1611	0	0	1842	0	0	1816	0
Flt Permitted		0.950									0.982	
Satd. Flow (perm)	0	1770	0	0	1611	0	0	1842	0	0	1816	0
Link Speed (mph)		30			30			25			30	
Link Distance (ft)		219			497			303			430	
Travel Time (s)		5.0			11.3			8.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	0	0	0	64	0	121	11	76	121	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	64	0	0	132	0	0	208	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 34.0%

ICU Level of Service A

Analysis Period (min) 15

Intersection												
Int Delay, s/veh 3.2												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	+	+	+	+	+	+	+	+	+	+	+	+
Traffic Vol, veh/h	10	0	0	0	0	59	0	111	10	70	111	10
Future Vol, veh/h	10	0	0	0	0	59	0	111	10	70	111	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	0	0	0	0	64	0	121	11	76	121	11
Major/Minor												
Minor2		Minor1			Major1			Major2				
Conflicting Flow All	438	411	127	406	411	127	132	0	0	132	0	0
Stage 1	279	279	-	127	127	-	-	-	-	-	-	-
Stage 2	159	132	-	279	284	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	529	531	923	555	531	923	1453	-	-	1453	-	-
Stage 1	728	680	-	877	791	-	-	-	-	-	-	-
Stage 2	843	787	-	728	676	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	471	501	923	531	501	923	1453	-	-	1453	-	-
Mov Cap-2 Maneuver	471	501	-	531	501	-	-	-	-	-	-	-
Stage 1	728	641	-	877	791	-	-	-	-	-	-	-
Stage 2	784	787	-	687	637	-	-	-	-	-	-	-
Approach												
SE			NW			NE			SW			
HCM Control Delay, s	12.8		9.2			0			2.8			
HCM LOS	B		A									
Minor Lane/Major Mvmt			NEL	NET	NER	NWL	NLn1	SELn1	SWL	SWT	SWR	
Capacity (veh/h)	1453		-	-	923	471	1453	-	-	-	-	
HCM Lane V/C Ratio	-		-	-	0.069	0.023	0.052	-	-	-	-	
HCM Control Delay (s)	0		-	-	9.2	12.8	7.6	0	-	-	-	
HCM Lane LOS	A		-	-	A	B	A	A	-	-	-	
HCM 95th %tile Q(veh)	0		-	-	0.2	0.1	0.2	-	-	-	-	

Lanes, Volumes, Timings
15: MA Route 3 SB On Ramp & Derby Street

Build Improvements
Timing Plan: MID PEAK



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	423	292	0	653	0	0
Future Volume (vph)	423	292	0	653	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Frt	0.939					
Flt Protected						
Satd. Flow (prot)	3323	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	3323	0	0	1863	0	0
Link Speed (mph)	30			40	30	
Link Distance (ft)	374			201	513	
Travel Time (s)	8.5			3.4	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	460	317	0	710	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	777	0	0	710	0	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 37.7%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

16: MA Route 3 SB Exit 15 On/Off Ramps & MA Route 3 SB On Ramp

Build Improvements

Timing Plan: MID PEAK



Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	162	0	0	292	0	533
Future Volume (vph)	162	0	0	292	0	533
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	0	1611
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	302			513	366	
Travel Time (s)	6.9			11.7	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	0	0	317	0	579
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	0	317	0	579
Sign Control	Free			Yield	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 36.3%

ICU Level of Service A

Analysis Period (min) 15

**Map - Proposed Delivery Station Building
Levels of Service**

**Build Improvements
Timing Plan: PM PEAK**



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BL Companies

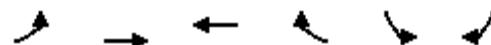
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Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

Build Improvements

Timing Plan: PM PEAK



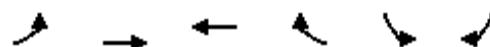
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	162	914	721	556	111	221
Future Volume (vph)	162	914	721	556	111	221
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165			0	140	0
Storage Lanes	1			1	2	1
Taper Length (ft)	100				250	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.272				0.950	
Satd. Flow (perm)	507	3539	3539	1583	3433	1583
Right Turn on Red				Yes		No
Satd. Flow (RTOR)				604		
Link Speed (mph)		30	40		30	
Link Distance (ft)		274	566		547	
Travel Time (s)		6.2	9.6		12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	993	784	604	121	240
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	993	784	604	121	240
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	4 5
Switch Phase						
Minimum Initial (s)	6.0	10.0	10.0	10.0	6.0	
Minimum Split (s)	13.0	17.0	17.0	17.0	12.0	
Total Split (s)	23.0	78.0	55.0	55.0	12.0	
Total Split (%)	25.6%	86.7%	61.1%	61.1%	13.3%	
Maximum Green (s)	16.0	71.0	48.0	48.0	6.0	
Yellow Time (s)	4.5	5.0	5.0	5.0	3.0	
All-Red Time (s)	2.5	2.0	2.0	2.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	None	None	None	
Act Effect Green (s)	63.2	63.2	47.3	47.3	13.8	29.7
Actuated g/C Ratio	0.70	0.70	0.53	0.53	0.15	0.33
v/c Ratio	0.37	0.40	0.42	0.54	0.23	0.46
Control Delay	7.6	5.3	14.4	3.2	34.4	26.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.6	5.3	14.4	3.2	34.4	26.4
LOS	A	A	B	A	C	C
Approach Delay		5.6	9.5		29.1	
Approach LOS		A	A		C	

Lanes, Volumes, Timings

1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

Build Improvements

Timing Plan: PM PEAK



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	34	115	138	0	30	105
Queue Length 95th (ft)	53	127	188	51	57	170
Internal Link Dist (ft)		194	486		467	
Turn Bay Length (ft)	165				140	
Base Capacity (vph)	580	2791	1936	1139	524	646
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.36	0.40	0.53	0.23	0.37

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 56 (62%), Referenced to phase 2:EBTL, Start of Yellow

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 10.4

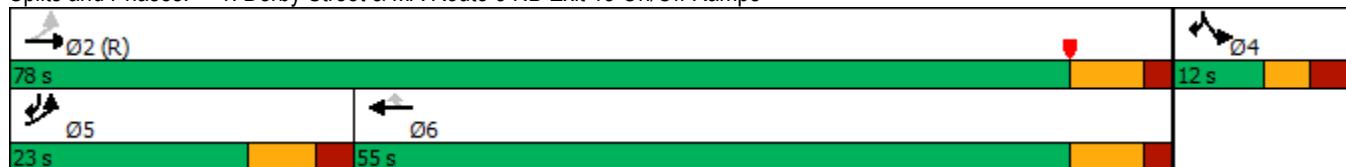
Intersection LOS: B

Intersection Capacity Utilization 55.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Derby Street & MA Route 3 NB Exit 15 On/Off Ramps

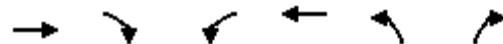


Lanes, Volumes, Timings

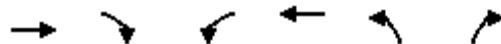
2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street

Build Improvements

Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations	↑↑		↑	↑	↑	↑↑	
Traffic Volume (vph)	632	0	394	548	94	444	
Future Volume (vph)	632	0	394	548	94	444	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	120		0	0	
Storage Lanes		0	1		1	2	
Taper Length (ft)			100		25		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	0.88	
Frt					0.850		
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3539	0	1770	1863	1770	2787	
Flt Permitted			0.255		0.950		
Satd. Flow (perm)	3539	0	475	1863	1770	2787	
Right Turn on Red		Yes			No		
Satd. Flow (RTOR)							
Link Speed (mph)	30		40		30		
Link Distance (ft)	144		854		302		
Travel Time (s)	3.3		14.6		6.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	687	0	428	596	102	483	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	687	0	428	596	102	483	
Turn Type	NA		pm+pt	NA	Prot	pt+ov	
Protected Phases	2		1	16	3	31	6
Permitted Phases			16				
Detector Phase	2		1	16	3	31	
Switch Phase							
Minimum Initial (s)	10.0		6.0		6.0		10.0
Minimum Split (s)	15.5		11.5		12.0		15.5
Total Split (s)	52.0		24.0		14.0		76.0
Total Split (%)	57.8%		26.7%		15.6%		84%
Maximum Green (s)	46.5		18.5		8.0		70.5
Yellow Time (s)	4.5		4.5		3.5		4.5
All-Red Time (s)	1.0		1.0		2.5		1.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	5.5		5.5		6.0		
Lead/Lag	Lag		Lead				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	C-Min		None		None		C-Min
Act Effect Green (s)	34.6		62.8	62.8	15.7	43.9	
Actuated g/C Ratio	0.38		0.70	0.70	0.17	0.49	
v/c Ratio	0.50		0.65	0.46	0.33	0.36	
Control Delay	20.9		23.3	10.7	34.9	14.6	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	20.9		23.3	10.7	34.9	14.6	
LOS	C		C	B	C	B	
Approach Delay	20.9		16.0		18.1		
Approach LOS	C		B	B			



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Queue Length 50th (ft)	172		163	104	52	82	
Queue Length 95th (ft)	241		262	274	92	124	
Internal Link Dist (ft)	64			774	222		
Turn Bay Length (ft)			120				
Base Capacity (vph)	1828		667	1459	308	1380	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.38		0.64	0.41	0.33	0.35	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 46 (51%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 18.0

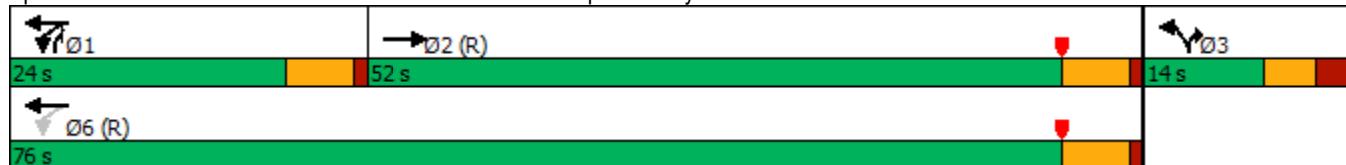
Intersection LOS: B

Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: MA Route 3 SB Exit 15 On/Off Ramps & Derby Street



Lanes, Volumes, Timings

Build Improvements

3: Pond Park Road/Private Drive & Derby Street

Timing Plan: PM PEAK

	→	→	←	←	→	←	↑	↑	↓	↓	↑	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	768	56	97	525	20	193	0	334	61	0	20
Future Volume (vph)	0	768	56	97	525	20	193	0	334	61	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	270		0	0		0	0		0
Storage Lanes	0		0	1		0	0		1	0		1
Taper Length (ft)	25			80			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990			0.994				0.850			0.850
Flt Protected				0.950				0.950			0.950	
Satd. Flow (prot)	0	3504	0	1770	1852	0	0	1770	1583	0	1770	1583
Flt Permitted				0.217				0.714			0.524	
Satd. Flow (perm)	0	3504	0	404	1852	0	0	1330	1583	0	976	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			4				108			109
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		530			374			328			180	
Travel Time (s)		9.0			6.4			8.9			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	835	61	105	571	22	210	0	363	66	0	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	896	0	105	593	0	0	210	363	0	66	22
Turn Type		NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA	Prot
Protected Phases		2			1	6			8	18		4
Permitted Phases		2			6			8			4	
Detector Phase	2	2		1	6		8	8	18	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	16.0	16.0		12.0	16.0		12.0	12.0		12.0	12.0	12.0
Total Split (s)	49.0	49.0		14.0	63.0		27.0	27.0		27.0	27.0	27.0
Total Split (%)	54.4%	54.4%		15.6%	70.0%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	43.0	43.0		8.0	57.0		21.0	21.0		21.0	21.0	21.0
Yellow Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0			0.0			0.0		0.0
Total Lost Time (s)		6.0		6.0	6.0		6.0			6.0		6.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None
Act Effect Green (s)	44.8		58.1	58.1			19.9	33.2		19.9	19.9	
Actuated g/C Ratio	0.50		0.65	0.65			0.22	0.37		0.22	0.22	
v/c Ratio	0.51		0.28	0.50			0.72	0.56		0.31	0.05	
Control Delay	17.5		7.2	7.8			45.7	17.9		31.2	0.2	
Queue Delay		0.0	0.0	0.0			0.0	0.0		0.0	0.0	
Total Delay	17.5		7.2	7.8			45.7	17.9		31.2	0.2	
LOS	B		A	A			D	B		C	A	
Approach Delay	17.5			7.7			28.1			23.4		
Approach LOS	B			A			C			C		

Lanes, Volumes, Timings

3: Pond Park Road/Private Drive & Derby Street

Build Improvements

Timing Plan: PM PEAK



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	172			7	34			110	110		31	0
Queue Length 95th (ft)	260			40	132			174	173		64	0
Internal Link Dist (ft)	450				294			248			100	
Turn Bay Length (ft)				270								
Base Capacity (vph)	1813			383	1229			333	639		244	478
Starvation Cap Reductn	0			0	0			0	0		0	0
Spillback Cap Reductn	0			0	0			0	0		0	0
Storage Cap Reductn	0			0	0			0	0		0	0
Reduced v/c Ratio	0.49			0.27	0.48			0.63	0.57		0.27	0.05

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 17.4

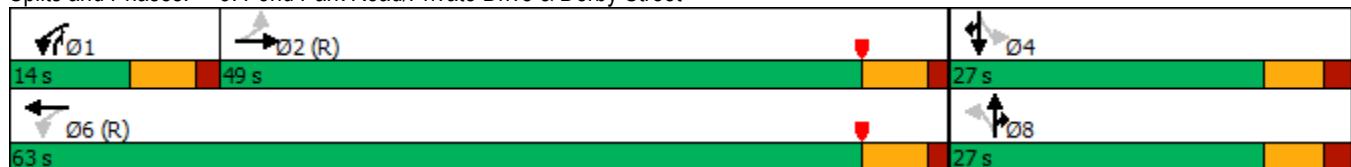
Intersection LOS: B

Intersection Capacity Utilization 84.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Pond Park Road/Private Drive & Derby Street



Lanes, Volumes, Timings
4: Industrial Park Road & Site Drive North

Build Improvements
Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Volume (vph)	0	72	0	10	234	0
Future Volume (vph)	0	72	0	10	234	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected					0.950	
Satd. Flow (prot)	1611	0	0	1863	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	1611	0	0	1863	1770	0
Link Speed (mph)	30			30	25	
Link Distance (ft)	1962			409	430	
Travel Time (s)	44.6			9.3	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	78	0	11	254	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	78	0	0	11	254	0
Sign Control	Free			Stop	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 24.1%

ICU Level of Service A

Analysis Period (min) 15

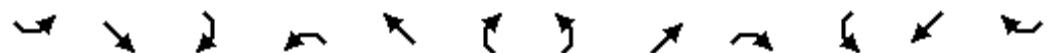
Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑		↔	↔		
Traffic Vol, veh/h	0	72	0	10	234	0
Future Vol, veh/h	0	72	0	10	234	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	78	0	11	254	0
Major/Minor	Major1	Minor2				
Conflicting Flow All	0	0	39	78		
Stage 1	-	-	0	0		
Stage 2	-	-	39	78		
Critical Hdwy	-	-	6.42	6.52		
Critical Hdwy Stg 1	-	-	-	-		
Critical Hdwy Stg 2	-	-	5.42	5.52		
Follow-up Hdwy	-	-	3.518	4.018		
Pot Cap-1 Maneuver	-	-	973	812		
Stage 1	-	-	-	-		
Stage 2	-	-	983	830		
Platoon blocked, %	-	-				
Mov Cap-1 Maneuver	-	-	973	0		
Mov Cap-2 Maneuver	-	-	973	0		
Stage 1	-	-	-	0		
Stage 2	-	-	983	0		
Approach	EB	WB				
HCM Control Delay, s	0					
HCM LOS	-					
Minor Lane/Major Mvmt	EBT	EBRWBLn1				
Capacity (veh/h)	-	-	-			
HCM Lane V/C Ratio	-	-	-			
HCM Control Delay (s)	-	-	-			
HCM Lane LOS	-	-	-			
HCM 95th %tile Q(veh)	-	-	-			

Lanes, Volumes, Timings

5: Industrial Park Road & Site Drive South/Private Drive

Build Improvements

Timing Plan: PM PEAK



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	0	0	0	0	52	0	172	0	42	30	0
Future Volume (vph)	10	0	0	0	0	52	0	172	0	42	30	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.865						
Flt Protected											0.972	
Satd. Flow (prot)	0	1770	0	0	1611	0	0	1863	0	0	1811	0
Flt Permitted											0.972	
Satd. Flow (perm)	0	1770	0	0	1611	0	0	1863	0	0	1811	0
Link Speed (mph)		30				30			25		30	
Link Distance (ft)		219				497			303		430	
Travel Time (s)		5.0				11.3			8.3		9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	0	0	0	57	0	187	0	46	33	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	57	0	0	187	0	0	79	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 30.2%

ICU Level of Service A

Analysis Period (min) 15

Intersection

Int Delay, s/veh 3.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	10	0	0	0	0	52	0	172	0	42	30	0
Future Vol, veh/h	10	0	0	0	0	52	0	172	0	42	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	0	0	0	0	57	0	187	0	46	33	0

Major/Minor	Minor2	Minor1			Major1			Major2				
Conflicting Flow All	341	312	33	312	312	187	33	0	0	187	0	0
Stage 1	125	125	-	187	187	-	-	-	-	-	-	-
Stage 2	216	187	-	125	125	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	613	603	1041	641	603	855	1579	-	-	1387	-	-
Stage 1	879	792	-	815	745	-	-	-	-	-	-	-
Stage 2	786	745	-	879	792	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	558	582	1041	624	582	855	1579	-	-	1387	-	-
Mov Cap-2 Maneuver	558	582	-	624	582	-	-	-	-	-	-	-
Stage 1	879	765	-	815	745	-	-	-	-	-	-	-
Stage 2	734	745	-	849	765	-	-	-	-	-	-	-

Approach	SE	NW			NE			SW		
HCM Control Delay, s	11.6	9.5			0			4.5		
HCM LOS	B	A								

Minor Lane/Major Mvmt	NEL	NET	NER	NWL	Ln1 SEL	Ln1	SWL	SWT	SWR
Capacity (veh/h)	1579	-	-	855	558	1387	-	-	-
HCM Lane V/C Ratio	-	-	-	0.066	0.019	0.033	-	-	-
HCM Control Delay (s)	0	-	-	9.5	11.6	7.7	0	-	-
HCM Lane LOS	A	-	-	A	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0.1	-	-	-

Lanes, Volumes, Timings
15: MA Route 3 SB On Ramp & Derby Street

Build Improvements
Timing Plan: PM PEAK



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↓			↑		
Traffic Volume (vph)	632	531	0	642	0	0
Future Volume (vph)	632	531	0	642	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Frt	0.932					
Flt Protected						
Satd. Flow (prot)	3299	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	3299	0	0	1863	0	0
Link Speed (mph)	30			40	30	
Link Distance (ft)	374			201	513	
Travel Time (s)	8.5			3.4	11.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	687	577	0	698	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1264	0	0	698	0	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 37.8%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

16: MA Route 3 SB Exit 15 On/Off Ramps & MA Route 3 SB On Ramp

Build Improvements

Timing Plan: PM PEAK



Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	394	0	0	531	0	538
Future Volume (vph)	394	0	0	531	0	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	0	1611
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	302			513	366	
Travel Time (s)	6.9			11.7	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	428	0	0	577	0	585
Shared Lane Traffic (%)						
Lane Group Flow (vph)	428	0	0	577	0	585
Sign Control	Free			Yield	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 56.4%

ICU Level of Service B

Analysis Period (min) 15